# Air Quality Assessment:
## Localised Impacts of Tottenham Hotspur Construction Compound

September 2015

Experts in air quality management & assessment

## Document Control

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## Executive Summary

Concrete delivery is the source of the greatest anticipated number of vehicle movements to and from the Tottenham Hotspur Football Club (THFC) development site during the construction works. There are no local concrete batching plant within the borough. Batching concrete at the proposed construction compound on White Hart Lane would greatly reduce the distance the concrete delivery vehicles would have to travel and thus reduce the air quality impacts on the wider area. There are, however, likely to be some localised adverse impacts of this compound on the receptors along White Hart Lane; this is mainly due to rerouting the construction traffic.

Existing air quality conditions have been described using the results of monitoring carried out by Haringey Council, information published by Defra, and detailed baseline dispersion modelling. The operational impacts have been assessed using detailed dispersion modelling. Concentrations of the key air pollutants associated with road traffic, i.e. nitrogen dioxide and fine particulate matter ($PM_{10}$ and $PM_{2.5}$), have been determined with and without the development. The predicted concentrations have been compared with air quality objectives set by the Government to protect human health.

The operational dust impacts have been assessed qualitatively, taking account of the design of the development and the use of best available techniques for such facilities as outlined in guidance published by Defra. The site will have electric power provision and no on-site power generation is required.

Existing conditions within the study area show poor quality, with concentrations of nitrogen dioxide exceeding the annual mean objective along High Road south of the development site. The site lies within an Air Quality Management Area.

The maximum daily average construction related traffic for the THFC site (assuming no construction compound) on High Road, of 41 HGVs, leads to moderate adverse impacts at locations along High Road. Use of the construction compound will lead to a small reduction in HGV movements along High Road north of White Hart Lane; this is unlikely, however, to remove the moderate adverse impacts. The additional traffic along White Hart Lane will introduce moderate adverse impacts along this road.

The assessment has demonstrated that use of the construction compound will give rise to no significant increase in concentrations of $PM_{10}$ and $PM_{2.5}$ at relevant locations; concentrations will remain below the objectives (a maximum of 84 % of an objective) and the impacts will all be *negligible*. In the case of nitrogen dioxide, the percentage increases are predicted to range from 0% to 1%; annual mean concentrations will remain above the objective at the majority of the receptor locations (ranging between 78% and 159% and of the objective), with the impacts ranging from *negligible* to *moderate adverse*. It should be noted that there are some reductions in concentrations in areas along High Road north of White Hart Lane (Receptors 13-16), although

these are rounded to 0% and therefore are not significant. The localised impacts will be in addition to the existing moderate adverse impacts associated with the introduction of construction traffic for the THFC development, but will be temporary in nature and should be recognised in the context of expected air quality benefits over the wider area.

The facility itself will be designed to include a high level of abatement, following Defra guidance on the best available techniques. It is thus judged that dust emissions from the site itself will be very low, and unlikely to have a significant adverse impact on sensitive receptors in the local area.

Overall, the localised operational air quality effects of the proposed compound are judged to be *significant*, but temporary.

The construction related traffic is expected to conform to the Euro VI emission standards. This will reduce the localised impacts in particular along White Hart Lane. It is not considered essential to provide any additional mitigation. It may also be possible to minimise the impacts by using hybrid or electric vehicles to transport the concrete from the construction site to the THFC development site. The feasibility of this is unknown and would need to be investigated; electric HGVs for movement of concrete may not be available commercially.

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# 1 Introduction

1.1 This report describes the potential local air quality impacts associated with the proposed construction compound at White Hart Lane in the London Borough (LB) of Haringey. The assessment has been carried out by Air Quality Consultants Ltd on behalf of Tottenham Hotspur Football Club (THFC).

1.2 The proposed development will consist of a purpose-built concrete batching plant, which will serve the THFC development. Without the compound, the only viable alternative would be to import concrete for the THFC development from outside of the borough, as there is no room for a concrete batching plant on the THFC site.

1.3 When compared with importing concrete from outside of the borough, use of the construction compound would greatly reduce the distance the concrete delivery vehicles would have to travel and thus reduce the adverse air quality impacts on the wider area. However, there are likely to be some localised adverse impacts on the receptors along White Hart Lane. This assessment considers these localised adverse impacts and compares the two scenarios: without construction compound versus with construction compound. While only the adverse impacts have been quantified, the findings should be recognised in the context of the wider benefits that are expected.

1.4 The batching plant within the construction compound will operate from late 2015 until 2017, and it is anticipated that 65,000 $m^3$ of concrete will be produced within this time. Concrete will be produced from cement, ground granulated blast-furnace slag (GGBS), limestone fines, fine and coarse aggregates, water and admixture. Once all of the constituents have been mixed, the wet concrete will be discharged into a truck-mixer for transportation by road to the THFC development site located approximately 250 m away.

1.5 Traffic flows have been provided by Tim Spencer and Co and are based on the quantity of materials required. The proposed compound will lead to:

- *an increase in annual average daily traffic flows of construction related traffic of 28 HGVs along White Hart Lane;*
- *a reduction in annual average daily traffic flows of construction related traffic along High Road north of White Hart Lane, from 41 HGVs to 31 HGVs; and*
- *an increase in annual average daily traffic flows of construction related traffic along High Road south of White Hart Lane to the THFC site entrance, from 41 to 58 HGVs.*

1.6 The construction related traffic on High Road of 41 HGVs accessing the THFC site (assuming no construction compound) has been show to lead to moderate adverse impacts at locations along High Road. The small reduction in vehicle movements along High Road north of White Hart Lane,

with the compound, is unlikely to remove these moderate adverse impacts. The additional traffic along White Hart Lane may introduce new adverse impacts.

1.7 This report focuses on the impacts of the changes in traffic emissions due to the construction compound on air quality at existing residential properties. The main air pollutants of concern related to traffic emissions are nitrogen dioxide and fine particulate matter ($PM_{10}$ and $PM_{2.5}$). There is also the potential for operational dust emissions to arise, given that one of the site's primary purposes is to handle powdered materials. Both of these potential impacts have been assessed.

1.8 The Greater London Authority's (GLA's) London Plan (GLA, 2015) requires certain developments to be assessed in terms of their air quality neutrality. The Supplementary Planning Guidance (SPG) on Sustainable Design and Construction (GLA, 2014a) details the methodology for this assessment. However, given that the proposed batching plant will only operate until 2017, it is judged to be not necessary to assess the air quality neutrality of this development.

1.9 It is understood that there will be no requirement for demolition, earthworks or construction at the proposed development site. All plant are understood to be 'mobile', with no permanent structural work required. Furthermore, there will be no unpaved ground at the site. It is therefore judged not necessary to assess the potential dust impacts from the installation phase.

1.10 It is understood that the concrete batching facility will use only electric-powered plant, with no diesel or gas-fired fixed plant utilised in the batching process. Thus, exhaust emissions from the compound are not considered further.

1.11 This report describes existing local air quality conditions (2014), and the predicted air quality in the future assuming that the proposed development does, or does not proceed. The assessment of traffic-related impacts focuses on 2016, which is the first full year of operation. The "Without Scheme" scenario for 2016 includes the construction traffic associated with the THFC development site, as well as the HGVs used to import concrete from outside of the borough, while the "With Scheme" scenario assumes that all concrete batching operations are undertaken at the proposed compound at White Hart Lane.

1.12 This report has been prepared taking into account all relevant local and national guidance and regulations.

# 2 Policy Context and Assessment Criteria

## Air Quality Strategy

2.1 The Air Quality Strategy published by the Department for Environment, Food, and Rural Affairs (Defra) provides the policy framework (Defra, 2007) for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

## Planning Policy

### *National Policies*

2.2 The National Planning Policy Framework (NPPF) (2012) sets out planning policy for England in one place. It places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. One of the twelve core planning principles notes that planning should *"contribute to…reducing pollution"*. To prevent unacceptable risks from air pollution, planning decisions should ensure that new development is appropriate for its location. The NPPF states that the effects of pollution on health and the sensitivity of the area and the development should be taken into account.

2.3 More specifically the NPPF makes clear that: *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan"*.

2.4 The NPPF is now supported by Planning Practice Guidance (PPG) (DCLG, 2014), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states that *"Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values"* and *"It is important that the potential impact of new development on air quality is taken into account … where the national*

*assessment indicates that relevant limits have been exceeded or are near the limit".* The role of the local authorities is covered by the LAQM regime, with the PPG stating that local authority Air Quality Action Plans "*identify measures that will be introduced in pursuit of the objectives*". In addition, the PPG makes clear that *"Odour and dust can also be a planning concern, for example, because of the effect on local amenity"*.

2.5 The PPG states that *"Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife)".*

2.6 The PPG sets out the information that may be required in an air quality assessment, making clear that *"Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality"*. It also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that *"Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact".*

### *The London Plan*

2.7 The London Plan (GLA, 2015) sets out the spatial development strategy for London consolidated with alterations made to the original plan since 2011. It brings together all relevant strategies, including those relating to air quality.

2.8 Policy 7.14, 'Improving Air Quality', addresses the spatial implications of the Mayor's Air Quality Strategy and how development and land use can help achieve its objectives. It recognises that Boroughs should have policies in place to reduce pollutant concentrations, having regard to the Mayor's Air Quality Strategy.

2.9 Policy 7.14B(c), requires that development proposals should be "*at least 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as designated Air Quality Management Areas (AQMAs))*". Further details of the London Plan in relation to planning decisions are provided in Appendix A1.

### *The Mayor's Air Quality Strategy*

2.10 The revised Mayor's Air Quality Strategy (MAQS) was published in December 2010 (GLA, 2010). The overarching aim of the Strategy is to reduce pollution concentrations in London to achieve compliance with the EU limit values as soon as possible. The Strategy commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures. These additional measures and the role of the Low Emission Zone are described in Appendix A1.

### GLA SPG: Sustainable Design and Construction

2.11 The GLA's SPG on Sustainable Design and Construction (GLA, 2014a) provides details on delivering some of the priorities in the London Plan. Section 4.3 covers Air Pollution. It defines when developers will be required to submit an air quality assessment, explains how location and transport measures can minimise emissions to air, and provides emission standards for gas-fired boilers, Combined Heat and Power (CHP) and biomass plant.

### GLA SPG: The Control of Dust and Emissions During Construction and Demolition

2.12 The GLA's SPG on The Control of Dust and Emissions During Construction and Demolition (GLA, 2014b) outlines a risk assessment based approach to considering the potential for dust generation from a construction site, and sets out what mitigation measures should be implemented to minimise the risk of construction dust impacts, dependent on the outcomes of the risk assessment. This guidance is largely based on the Institute of Air Quality Management's (IAQM) 2014 guidance on the Assessment of dust from demolition and construction (Institute of Air Quality Management, 2014), and it states that "*the latest version of the IAQM Guidance should be used*".

### Local Transport Plan

2.13 The Haringey Local Implementation Plan (Haringey Council, 2011) sets out how the Mayor's Transport Strategy will be delivered within Haringey up until 2031. Air quality is referred to as one of the main transport challenges. It is the objective of the Council to: *'Improve air quality within the borough through initiatives to reduce and mitigate the effects of pollutant emissions from road and diesel operated rail transport.'*

2.14 The Council has set the challenge to improve air quality within the borough by reducing car use, it states that, *'Haringey Council will continue to introduce initiatives that reduce air pollutant emissions from road transport by promoting smarter travel choices, raising awareness and encouraging sustainable travel behaviour. These include promoting walking and cycling for short journeys, and increased use of public transport. More sustainable car use will be encourage through car clubs, car sharing, and the use of fuel efficient vehicles, such as electric vehicles, and smarter driving techniques'.*

### Local Policies

2.15 Haringey's Local Plan (Haringey Council, 2013) was formally adopted in March 2013 and sets out the strategic policies within the borough for the period 2013 to 2016. The Local Plan Strategic Policy 7 Transport relates to air quality in its section on, *"Delivering Action on Climate Change and Quality and Healthy Places"* and states that it will work with its partners in the promotion of traffic management schemes such as:

- *"Minimising congestion and addressing the environmental impacts of travel;*

- *Promoting public transport, walking and cycling…*
- *..Seeking to locate major trip generating developments in locations with good access to public transport and so better integrate transport and land use planning.*
- *Adopting maximum car parking standards and car free housing wherever feasible;…*
- *…Supporting measures to influence behavioural change such as promoting low carbon vehicles…"*

2.16 A number of policies included within Haringey's Unitary Development Plan (Haringey Council, 2013) have been saved as part of the new local plan. A number of the saved policies refer to air quality and include:

*"Policy UD1 Planning Statements:*

*Where appropriate, all development proposals (except 'householder development') are to be accompanied by one or more of the following:*

*i) air quality statement, for significant impact on air quality…*

*Policy UD3 General Principles:*

*"The Council will require development proposals to demonstrate that:*

*a) there is no significant adverse impact on residential amenity or other surrounding uses in terms of loss of daylight or sunlight, privacy, overlooking, aspect and the avoidance of air, water, light and noise, pollution (including from the contamination of groundwater/water courses or from construction noise) and of fume and smell nuisance; …"*

*Policy ENV7 Air, Water and Light Pollution:*

*The Council will control potential pollution resulting from development in the Borough by:*

*b) requiring developments to include measures to avoid, reduce and only then mitigate the emissions of pollutants, where appropriate; …"*

*2.17* Much of the detail to support the UDP policies is contained within accompanying Supplementary Planning Documents (SPDs), which are a material consideration for development control purposes. The Council adopted the Sustainable Design & Construction SPD in March 2013 (Haringey Council, 2013), Section 7 is on pollution and sets out the requirements for an air quality assessment and states that, *"Any mitigation measures should be incorporated into the design prior to submission".*

## Air Quality Action Plan

2.18 The London Borough of Haringey has declared an AQMA for nitrogen dioxide that covers the whole Borough. The Council has since developed an Air Quality Action Plan (Haringey Council, 2011). The main objectives of the Action Plan are to:

- *"demonstrate the Council's commitment to improving air quality and lead by example*
- *provide an overview of local key policies with respect to air quality*
- *improve air quality whilst maintaining economic stability and to explore wider economic opportunities*
- *involve all relevant Council departments and external agencies where appropriate, to ensure a balances and integrated approach in Haringey*
- *improve the quality of life and health of the residents and workforce of Haringey".*

## Assessment Criteria

### *Health Criteria*

2.19 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations, 2000, Statutory Instrument 928 (2000) and the Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043 (2002).

2.20 The objectives for nitrogen dioxide and $PM_{10}$ were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. Measurements across the UK have shown that the 1-hour nitrogen dioxide objective is unlikely to be exceeded where the annual mean concentration is below 60 $\mu g/m^3$ (Defra, 2009). Therefore, 1-hour nitrogen dioxide concentrations will only be considered if the annual mean concentration is above this level. Measurements have also shown that the 24-hour $PM_{10}$ objective could be exceeded where the annual mean concentration is above 32 $\mu g/m^3$ (Defra, 2009). The predicted annual mean $PM_{10}$ concentrations are thus used as a proxy to determine the likelihood of an exceedence of the 24-hour mean $PM_{10}$ objective. Where predicted annual mean concentrations are below 32 $\mu g/m^3$ it is unlikely that the 24-hour mean objective will be exceeded.

2.21 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2009). The annual mean objectives for nitrogen dioxide and $PM_{10}$ are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour objective for $PM_{10}$ is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

2.22 The European Union has also set limit values for nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$. The limit values for nitrogen dioxide are the same numerical concentrations as the UK objectives, but achievement of these values is a national obligation rather than a local one (Directive 2008/50/EC of the European Parliament and of the Council, 2008). In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded.

2.23 The relevant air quality criteria for this assessment are provided in Table 1.

**Table 1: Air Quality Criteria for Nitrogen Dioxide, $PM_{10}$ and $PM_{2.5}$**

| Pollutant | Time Period | Objective |
|---|---|---|
| **Nitrogen Dioxide** | 1-hour Mean | 200 μg/m$^3$ not to be exceeded more than 18 times a year |
| | Annual Mean | 40 μg/m$^3$ |
| **Fine Particles ($PM_{10}$)** | 24-hour Mean | 50 μg/m$^3$ not to be exceeded more than 35 times a year |
| | Annual Mean | 40 μg/m$^3$ [b] |
| **Fine Particles ($PM_{2.5}$)** [a] | Annual Mean | 25 μg/m$^3$ |

[a] The $PM_{2.5}$ objective, which is to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[b] A proxy value of 32 μg/m$^3$ as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean $PM_{10}$ objective being exceeded. Measurements have shown that, above this concentration, exceedences of the 24-hour mean $PM_{10}$ objective are possible (Defra, 2009).

### *Dust Criteria*

2.24 There are no formal assessment criteria for dust. It is thus typical to take a qualitative approach, considering the scale of the likely emissions and the distances over which impacts are likely. The

approach developed by the Institute of Air Quality Management[1] (2014) (IAQM), on which the assessment methodology outlined in the GLA's SPG (GLA, 2014b) is based, has been incorporated into the operational dust impact assessment.

## *Descriptors for Air Quality Impacts and Assessment of Significance*

### Operational Dust Significance

2.25 Guidance from the IAQM (Institute of Air Quality Management, 2014) is that, with appropriate mitigation in place, the impacts of dust will be 'not significant'. The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that impacts will normally be 'not significant'.

### Operational Significance

#### *Health*

2.26 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. The approach developed jointly by Environmental Protection UK (EPUK) and the IAQM (EPUK & IAQM, 2015) has therefore been used. This includes defining descriptors of the impacts at individual receptors, which take account of the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors. Full details of the EPUK/IAQM approach are provided in Appendix A3. The approach includes elements of professional judgement, and the experience of the consultants preparing the report is set out in Appendix A4.

[1] The IAQM is the professional body for air quality practitioners in the UK.

# 3 Assessment Approach

## Existing Conditions

3.1 Existing sources of emissions within the study area have been defined using a number of approaches. Industrial and waste management sources that may affect the area have been identified using Defra's Pollutant Release and Transfer Register (Defra, 2015a). Local sources have also been identified through examination of the Council's Air Quality Review and Assessment reports.

3.2 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. This covers both the study area and nearby sites, the latter being used to provide context for the assessment. The background concentrations across the study area have been defined using the national pollution maps published by Defra (2015b). These cover the whole country on a 1x1 km grid. Current exceedences of the annual mean EU limit value for nitrogen dioxide have been identified using the maps of roadside concentrations published by Defra (2015c). These are the maps, currently based on 2012 data, used by the UK Government, together with the results from national AURN monitoring sites that operate to EU data quality standards, to report exceedences of the limit value to the EU.

## Operational Dust Impacts

3.3 The potential for dust impacts has been assessed qualitatively, taking account of the design of the development and the use of best available techniques for such facilities as outlined in guidance published by Defra (Defra, 2012). The IAQM construction dust guidance (Institute of Air Quality Management, 2014) has also been adapted and applied to further assess the potential for operational dust impacts.

## Road Traffic Impacts

### *Sensitive Locations*

3.4 Concentrations of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ have been predicted at a number of locations close to the proposed development. Receptors have been identified to represent worst-case exposure within these locations. When selecting these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links. The receptors have been located on the façades of the properties closest to the sources.

3.5 Nineteen existing residential properties have been identified as receptors for the assessment. These locations are shown in Figure 1. In addition, concentrations have been modelled at the

automatic monitoring site located at High Road, Haringey (HGY1), in order to verify the modelled results (see Appendix A5 for verification method).

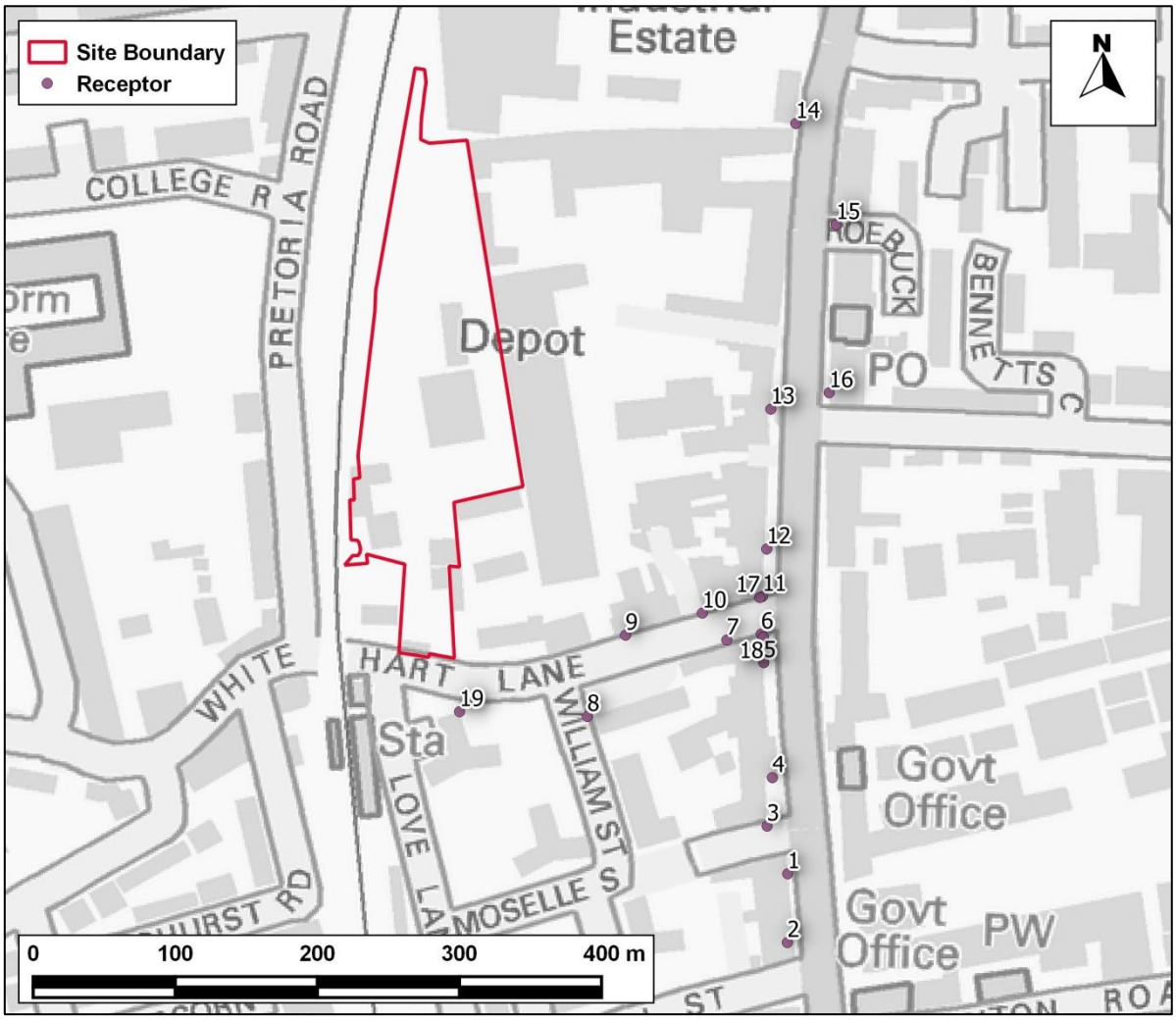


**Figure 1: Receptor Locations**

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### *Assessment Scenarios*

3.6 Predictions of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ concentrations have been carried out for a base year (2014), and the first proposed full year of operation (2016). For 2016, predictions have been made assuming both that the development does proceed (With Scheme), and does not proceed (Without Scheme). The Without Scheme scenario assumes that construction traffic travels directly to the THFC development site from outside the borough. A further 2016 sensitivity test has been carried out for nitrogen dioxide that involves assuming no reduction in emission factors for road traffic from the baseline year. This is to address the issue identified by Defra (Carslaw et al., 2011)

that road traffic emissions have not been declining as expected (see later section on uncertainty). Nitrogen dioxide concentrations in 2016 with and without the scheme are thus presented for two scenarios: 'With Emissions Reduction' and 'Without Emissions Reduction'.

3.7 The "Without Scheme" scenarios for 2016 include the construction traffic (including the import of concrete) for the THFC development site at High Road, while the "With Scheme" scenarios assume that all concrete batching operations are undertaken at the proposed compound at White Hart Lane.

### *Modelling Methodology*

3.8 Concentrations have been predicted using the ADMS-Roads dispersion model. Details of the model inputs and the model verification are provided in Appendix A5, together with the method used to derive current and future year background nitrogen dioxide concentrations. The air quality modelling has been carried out based on a number of assumptions that have had to be made, detailed further in Appendix A5. The main variable for road traffic modelling is the traffic data on which the model is based. Where possible a realistic worst-case approach has been adopted.

## Uncertainty

3.9 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as the model is required to simplify real-world conditions into a series of algorithms. An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A5). This can only be done for the road traffic model. The level of confidence in the verification process is necessarily enhanced when data from an automatic analyser have been used, as has been the case for this assessment (see Appendix A5). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of current year (2014) concentrations.

3.10 Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions.

3.11 Historically, large reductions in nitrogen oxides emissions have been projected, which has led to significant reductions in nitrogen dioxide concentrations from one year to the next being predicted. Over time, it was found that trends in measured concentrations did not reflect the rapid reductions that Defra and the DfT had predicted (Carslaw et al., 2011). This was evident across the UK, although the effect appeared to be greatest in inner London; there was also considerable inter-site variation. Emission projections over the 6 to 8 years prior to 2009 suggested that both annual

mean nitrogen oxides and nitrogen dioxide concentrations should have fallen by around 15-25%, whereas monitoring data showed that concentrations remained relatively stable, or even showed a slight increase. Analysis of more recent data for 23 roadside sites in London covering the period 2003 to 2012 showed a weak downward trend of around 5% over the ten years (Carslaw and Rhys-Tyler, 2013), but this still falls short of the improvements that had been predicted at the start of this period. This pattern of no clear, or limited, downward trend is mirrored in the monitoring data from the HGY1 monitor assembled for this study, as set out in Paragraph 4.5.

3.12 The reason for the disparity between the expected concentrations and those measured relates to the on-road performance of modern diesel vehicles. New vehicles registered in the UK have had to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. While the nitrogen oxides emissions from newer vehicles should be lower than those from equivalent older vehicles, the on-road performance of some modern diesel vehicles has often been no better than that of earlier models. This has been compounded by an increasing proportion of nitrogen dioxide in the nitrogen oxides emissions, i.e. primary nitrogen dioxide, which has a significant effect on roadside concentrations (Carslaw et al., 2011) (Carslaw and Rhys-Tyler, 2013).

3.13 Defra has attempted to account for the historical discrepancies in its latest emissions factors published in 2014 and incorporated in the Emission Factor Toolkit v6.0.2 used in this study. The new factors now show only limited reductions in overall vehicle emissions prior to 2014, but project some large improvements thereafter. This is principally because, where previous standards had limited on-road success, the best current evidence is that the 'Euro VI' and 'Euro 6' standards that new vehicles had to comply with from 2013/15[2] will deliver real improvements, as, for the first time, they will be compliant with the World Harmonized Test Cycle, which better represents real-world driving conditions[3] and also includes a separate slow-speed cycle for heavy duty vehicles. There is, nevertheless, limited information on whether the full improvements expected are being, and will be, delivered, so there remains some uncertainty as to whether emissions will reduce at the rates set out in Defra's Emission Factors Toolkit (Defra, 2015b).

3.14 To account for the remaining uncertainty over future vehicle emissions of nitrogen oxides and nitrogen dioxide, a sensitivity test has been conducted assuming that the future (2016) road traffic emissions per vehicle are unchanged from 2014 values (without emissions reduction). The predictions within this sensitivity test will almost certainly be over-pessimistic, as new Euro VI and Euro 6 vehicles will make up roughly 35% of HDVs and 20% of LDVs on the road in 2016, according to Defra's Emission Factors Toolkit (Defra, 2015b). Future concentrations due to road

[2] Euro VI refers to heavy duty vehicles, while Euro 6 refers to light duty vehicles. The timings for meeting the standards vary with vehicle type and whether the vehicle is a new model or existing model.

[3] The test cycle for real-world emissions for Euro 6 vehicles will not be implemented until about 2017. However, there is still expected to be a substantial improvement in NOx emissions from Euro 6 vehicles (as compared with Euro 5) from 2015 onwards.

traffic emissions will therefore be below the 'without emissions reduction' values, but may be above Defra's 'with emissions reduction' values i.e. they will lie between the two sets of values, but are likely to be closer to those derived using the official Defra values than those in the 'no emissions reduction' sensitivity test. Furthermore, the 'without emissions reduction' scenario is likely to be over-pessimistic as it is understood that the planned fleet of construction vehicles will be at least Euro IV, with the additional possibility of the use of hybrid-engine vehicles.

3.15 In addition, the dispersion modelling has assumed that sections of White Hart Lane and High Road are street canyons, which is precautionary as the model assumes that only limited dispersion occurs within the canyon. In reality, dispersion does occur within street canyons, particularly those which are wide and shallow, with uneven or broken facades on one or both sides, such as is the case with White Hart Lane and High Road. The consequence of this is that modelled nitrogen dioxide concentrations at the façades of properties within the canyons are likely to be higher than will occur in practice.

# 4 Site Description and Baseline Conditions

4.1 The proposed development site is located approximately 250 m by road to the west of the THFC development site. The site is bounded by White Hart Lane and the Lea Valley railway line to the south and west, respectively, and an existing industrial estate to the north and east. The site is currently unused, however it has previously been used as a car breakers yard.

4.2 There are existing residential properties immediately to the south of the site, as well as to the west on the opposite side of the railway line. A number of residential properties are also located to the east along High Road.

## Air Quality Review and Assessment

4.3 The LB of Haringey has investigated air quality within its area as part of its responsibilities under the LAQM regime. In July 2001 an AQMA was declared across the whole borough for exceedences of the annual mean nitrogen dioxide and 24-hour mean $PM_{10}$ objectives.

## Local Air Quality Monitoring

4.4 Haringey Council operates two automatic monitoring stations within its area. The Haringey High Road roadside automatic monitoring site is located approximately 700 m southeast of the development site. The Council also operates a number of nitrogen dioxide monitoring sites using diffusion tubes prepared and analysed by Lambeth Scientific Services (using the 50% TEA in acetone method). In 2014 diffusion tube monitoring was completed at four sites within approximately 1.5 km of the proposed batching plant (HR07 closed in September 2014). Results for the years 2009 to 2014 are summarised in Table 2 and the monitoring locations are shown in Figure 2.

**Table 2: Summary of Nitrogen Dioxide ($NO_2$) Monitoring (2009-2014) [ab]**

| Site No. | Site Type | Location | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|
| **Automatic Monitor - Annual Mean (µg/m$^3$) [a]** | | | | | | | | |
| **HGY1** | Roadside | High Road | **42** | **45** | 38 | **42** | **43** | **44** [c] |
| **Objective** | | | **40** | | | | | |
| **Automatic Monitor - No. of Hours > 200 µg/m$^3$** | | | | | | | | |
| **HGY1** | Roadside | High Road | 0 | 0 | 0 | 0 | 1 | 0 |
| **Objective** | | | **18** | | | | | |
| **Diffusion Tubes - Annual Mean (µg/m$^3$)** | | | | | | | | |
| **HR07** | Urban Background | Park View Road | 34 | 38 | 33 | 32 | 29 | 25 |
| **HR14** | Roadside | High Road | **48** | **47** | **44** | **46** | 39 | 37 |
| **HR23** | Roadside | High Street | - | - | **42** | 37 | **41** | 30 |
| **HR25** | Roadside | White Hart Lane | - | - | 36 | 37 | 34 | 34 |
| **Objective** | | | **40** | | | | | |

[a] Exceedences of the objectives are shown in bold.

[b] 2009 and 2010 data have been taken from the 2010 Air Quality Progress Report (Haringey Council, 2011), 2011 to 2014 data have been taken from the Air Quality Updating and Screening Assessment for 2014 (Haringey Council, 2015).

[c] Data capture was 64 % in 2014 and therefore results have been annualised in accordance with Box 3.2 in LAQM.TG(09) (Defra, 2009) (see Appendix A6).

4.5 Concentrations have exceeded or been close to exceeding the annual mean nitrogen dioxide objective at the roadside monitoring locations; these measured concentrations are considered to be representative of baseline conditions across the proposed development site. At the urban background diffusion tube monitoring site annual mean concentrations have been well below the annual mean objective.

4.6 Annual mean concentrations at the HR07 urban background site and the HR14 roadside site suggest an overall downward trend over the past six years. However, examining the data for the roadside automatic monitoring site, HGY1, which provides more accurate data, there is no significant trend in monitoring results over the last 10 years. This contrasts with the expected decline due to the progressive introduction of new vehicles operating to more stringent standards. The implications of this are discussed in Section 5 of this report.

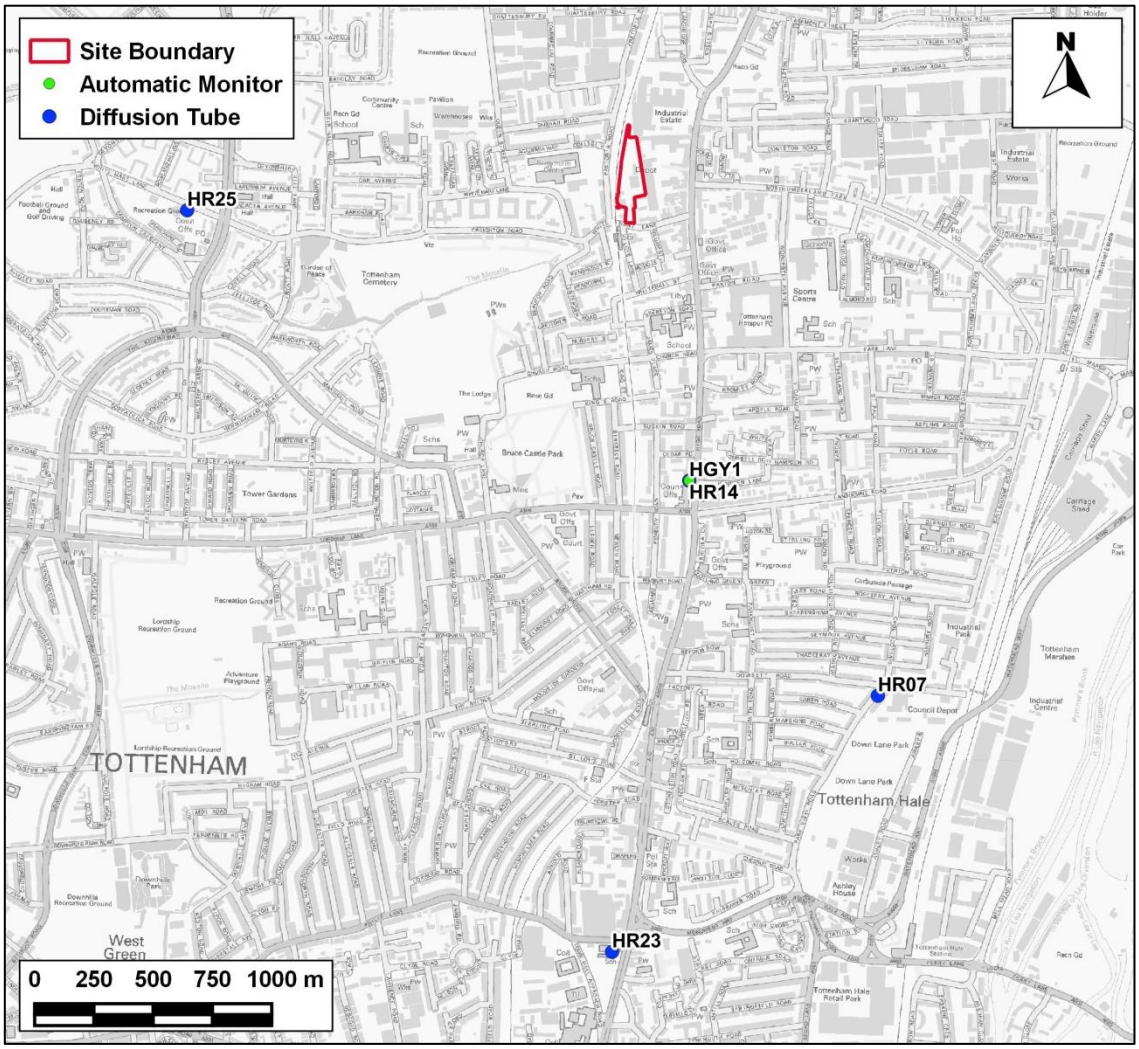


**Figure 2: Monitoring Locations**

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4.7 The Haringey HGY1 automatic monitoring station, located on High Road, measured $PM_{10}$ concentrations from 2009 to 2013; $PM_{10}$ monitoring ceased at this site in 2014. There are no other sites in Haringey which measure $PM_{10}$. Results for the years 2009 to 2013 are summarised in Table 3. $PM_{2.5}$ concentrations are also measured at this automatic monitor. Data for 2009-2014 are also presented in Table 3. Measured concentrations of both $PM_{10}$ and $PM_{2.5}$ have consistently been well below the relevant objectives and have remained relatively stable.

**Table 3: Summary of $PM_{10}$ and $PM_{2.5}$ Automatic Monitoring (2009-2014)**

| Site No. | Site Type | Location | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|
| **$PM_{10}$ Annual Mean ($\mu g/m^3$) [a]** | | | | | | | | |
| **HGY1** | Roadside | High Road | 21 | 23 | - | 23 | 25 | - |
| **Objective** | | | **40** | | | | | |
| **$PM_{10}$ No. Days >50 $\mu g/m^3$** | | | | | | | | |
| **HGY1** | Roadside | High Road | 5 | 9 | - | 11 | 13 | - |
| **Objective** | | | **35** | | | | | |
| **$PM_{2.5}$ Annual Mean ($\mu g/m^3$)** | | | | | | | | |
| **HGY1** | Roadside | High Road | 15 | 18 | - | 18 | 18 | 16 [b] |
| **Objective** | | | **25** | | | | | |

[a] In 2011 the data were affected by the Tottenham riots.

[b] Reference equivalent. Data capture was 82% in 2014, and thus the results have been annualised in accordance with Box 3.2 in LAQM.TG(09) (Defra, 2009) (see Appendix 6.8).

## Exceedences of EU Limit Value

4.8 There are several AURN monitoring sites within the Greater London Urban Area that have measured exceedences of the annual mean nitrogen dioxide limit value. Furthermore, the national map of roadside annual mean nitrogen dioxide concentrations (Defra, 2015c), used to report exceedences of the limit value to the EU, identifies exceedences of this limit value in 2012 along many roads in London, including the High Road approximately 130 m to the east of the proposed development site. The Greater London Urban Area has thus been reported to the EU as exceeding the limit value for annual mean nitrogen dioxide concentrations. The national maps of roadside $PM_{10}$ and $PM_{2.5}$ concentrations show no exceedences of the limit values anywhere in London. These maps are for 2012 concentrations; detailed maps of predicted future year exceedences are not available (Defra, 2015c).

## Background Concentrations

### *National Background Pollution Maps*

4.9 In addition to these locally measured concentrations, estimated background concentrations in the study area have been determined for 2014 and the first full operational year of 2016 (Table 4). In the case of nitrogen dioxide, two sets of future-year backgrounds are presented to take into account uncertainty in future year vehicle emission factors. The derivation of background concentrations is described in Appendix A5. The background concentrations are all well below the objectives.

**Table 4: Estimated Annual Mean Background Pollutant Concentrations in 2014 and 2016 (µg/m$^3$)**

| Year | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|
| **2014** [a] | 27.5 - 27.6 | 21.4 | 14.7 |
| **2016 – Without Reductions in Traffic Emissions** [b] | 26.6 - 26.8 | n/a | n/a |
| **2016 – With Reductions in Traffic Emissions** [c] | 25.7 – 25.8 | 20.8 – 20.9 | 14.2 – 14.3 |
| **Objectives** | **40** | **40** | **25** |

n/a = not applicable. The range of values is for the different 1x1 km grid squares covering the study area.

[a] This assumes that road vehicle emission factors in 2014 remain the same as in 2011 (See Appendix A5).

[b] This assumes that road vehicle emission factors in 2016 remain the same as in 2011.

[c] This assumes that road vehicle emission factors reduce between 2014 and 2016 at the current 'official' rates.

## Baseline Dispersion Model Results

4.10 Baseline concentrations of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ have been modelled at each of the existing receptor locations (see Figure 1). The results, which cover both the existing (2014) and future year (2016) baseline (Without Scheme), are set out in Table 5 and Table 6. The future baseline for nitrogen dioxide covers the two scenarios: with the official reductions in vehicle emission factors and without these reductions. The modelled road components of nitrogen oxides concentrations have been adjusted by a factor of 1.89, which was derived during the model verification process (see Appendix A5 for details of the model verification). The modelled road components of $PM_{10}$ and $PM_{2.5}$ concentrations have been adjusted by a factor of 2.31.

**Table 5: Modelled Annual Mean Baseline Concentrations of Nitrogen Dioxide (µg/m$^3$) at Existing Receptors [ab]**

| Receptor | 2014 | 2016 Without Scheme [e] | |
|---|---|---|---|
| | | With 'Official' Emissions Reduction [c] | Without Emissions Reduction [d] |
| **1** | **46.7** | **42.8** | **46.2** |
| **2** | **44.6** | **41.0** | **44.1** |
| **3** | 37.1 | 34.3 | 36.5 |
| **4** | **45.0** | **41.4** | **44.5** |
| **5** | **47.7** | **43.8** | **47.2** |
| **6** | **53.0** | **48.7** | **52.4** |
| **7** | **46.4** | **42.8** | **45.8** |
| **8** | 33.8 | 31.4 | 33.1 |
| **9** | **46.3** | **42.6** | **45.6** |
| **10** | **48.8** | **44.9** | **48.2** |
| **11** | **52.4** | **48.1** | **51.9** |
| **12** | **49.0** | **44.9** | **48.4** |
| **13** | **52.7** | **48.2** | **52.2** |
| **14** | **55.3** | **50.6** | **54.9** |
| **15** | **63.9** | **58.4** | **63.6** |
| **16** | **62.9** | **57.5** | **62.6** |
| **17** | **47.8** | **44.0** | **47.3** |
| **18** | **46.1** | **42.4** | **45.7** |
| **19** | 34.0 | 31.5 | 33.3 |
| **Objective** | **40** | | |

[a] Exceedences of the objective are shown in bold.

[b] The highest concentration from any height with relevant exposure is shown.

[c] This assumes that road vehicle emission factors reduce between 2014 and 2016 at the current 'official' rates.

[d] This assumes that road vehicle emission factors in 2016 remain the same as in 2014.

[e] The 'Without Scheme' scenario is the 'With Scheme' scenario used in the construction-traffic assessment of the THFC stadium development.

**Table 6: Modelled Annual Mean Baseline Concentrations of $PM_{10}$ and $PM_{2.5}$ at Existing Receptors ($\mu g/m^3$) [a]**

| Receptor [b] | $PM_{10}$ [a] | | $PM_{2.5}$ | |
|---|---|---|---|---|
| | 2014 | 2016 Without Scheme [e] | 2014 | 2016 Without Scheme [e] |
| 1 | 24.3 | 23.6 | 16.6 | 15.9 |
| 2 | 24.0 | 23.3 | 16.4 | 15.7 |
| 3 | 22.8 | 22.2 | 15.6 | 15.0 |
| 4 | 24.1 | 23.4 | 16.4 | 15.8 |
| 5 | 24.5 | 23.8 | 16.7 | 16.0 |
| 6 | 25.5 | 24.7 | 17.4 | 16.6 |
| 7 | 24.4 | 23.6 | 16.6 | 15.9 |
| 8 | 22.3 | 21.7 | 15.3 | 14.8 |
| 9 | 24.4 | 23.6 | 16.6 | 15.9 |
| 10 | 24.8 | 24.0 | 16.9 | 16.2 |
| 11 | 25.4 | 24.6 | 17.3 | 16.5 |
| 12 | 24.7 | 24.0 | 16.8 | 16.1 |
| 13 | 25.4 | 24.6 | 17.3 | 16.5 |
| 14 | 25.9 | 25.1 | 17.6 | 16.8 |
| 15 | 27.7 | 26.7 | 18.7 | 17.8 |
| 16 | 27.5 | 26.5 | 18.6 | 17.7 |
| 17 | 24.6 | 23.8 | 16.8 | 16.1 |
| 18 | 24.3 | 23.5 | 16.6 | 15.9 |
| 19 | 22.5 | 21.9 | 15.4 | 14.8 |
| Objective | 32 [b] | | 25 | |

[a] The highest concentration from any height with relevant exposure is shown.

[b] While the annual mean $PM_{10}$ objective is 40 $\mu g/m^3$, 32 $\mu g/m^3$ is the annual mean concentration above which an exceedence of the 24-hour mean $PM_{10}$ concentration is possible, as outlined in LAQM.TG(09) (Defra, 2009). A value of 32 $\mu g/m^3$ is thus used as a proxy to determine the likelihood of exceedence of the 24-hour mean $PM_{10}$ objective, as recommended in EPUK & IAQM guidance (EPUK & IAQM, 2015).

[e] The 'Without Scheme' scenario is the 'With Scheme' scenario used in the construction-traffic assessment of the THFC stadium development.

### *2014 Baseline*

4.11 The predicted annual mean concentrations of nitrogen dioxide are above the objective at 16 of the 19 receptors. $PM_{10}$ and $PM_{2.5}$ are below the objective in 2014 at all receptors. Furthermore, the

annual mean $PM_{10}$ concentrations are below 32 µg/$m^3$ and therefore is it unlikely that the 24-hour mean $PM_{10}$ will be exceeded.

### *2016 Baseline With 'Official' Emission Reduction*

4.12 The predicted annual mean concentrations of nitrogen dioxide are above the objective at 16 of the 19 receptor locations. All of the predictions for $PM_{10}$ and $PM_{2.5}$ are well below the objectives. Furthermore, the annual mean $PM_{10}$ concentrations are below 32 µg/$m^3$ and therefore is it unlikely that the 24-hour mean $PM_{10}$ will be exceeded.

### *2016 Baseline Without Emission Reduction*

4.13 The predicted annual mean concentrations of nitrogen dioxide are above the objective at 16 of the 19 receptor locations.

4.14 These results are consistent with the conclusions of the LB of Haringey in the outcome of its air quality review and assessment work.

# 5 Impact Assessment

## Road Traffic Impacts

5.1 Predicted annual mean concentrations of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$ are set out in Table 7, Table 8 and Table 9 for both the "Without Scheme" and "With Scheme" scenarios. These tables also describe the impacts of using the construction compound over not using the construction compound, as part of the THFC development, at each receptor using the impact descriptors given in Appendix A3. For nitrogen dioxide, results are presented for two scenarios to reflect current uncertainty in Defra's future-year vehicle emission factors.

**Table 7: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations in 2016 (µg/m$^3$) [ab]**

| Receptor | With 'Official' Emissions Reduction [c] | | | | Without Emissions Reduction [d] | | | |
|---|---|---|---|---|---|---|---|---|
| | Without Scheme | With Scheme | % Change [d] | Impact Descriptor | Without Scheme | With Scheme | % Change [e] | Impact Descriptor |
| **1** | **42.8** | **42.9** | 0 | Negligible | **46.2** | **46.3** | 0 | Negligible |
| **2** | **41.0** | **41.0** | 0 | Negligible | **44.1** | **44.2** | 0 | Negligible |
| **3** | 34.3 | 34.3 | 0 | Negligible | 36.5 | 36.5 | 0 | Negligible |
| **4** | **41.4** | **41.4** | 0 | Negligible | **44.5** | **44.6** | 0 | Negligible |
| **5** | **43.8** | **43.9** | 0 | Negligible | **47.2** | **47.3** | 0 | Negligible |
| **6** | **48.7** | **48.9** | 0 | Negligible | **52.4** | **52.7** | 1 | Moderate Adverse |
| **7** | **42.8** | **42.9** | 0 | Negligible | **45.8** | **46.0** | 0 | Negligible |
| **8** | 31.4 | 31.4 | 0 | Negligible | 33.1 | 33.2 | 0 | Negligible |
| **9** | **42.6** | **42.8** | 1 | Moderate Adverse | **45.6** | **45.9** | 1 | Moderate Adverse |
| **10** | **44.9** | **45.1** | 1 | Moderate Adverse | **48.2** | **48.4** | 1 | Moderate Adverse |
| **11** | **48.1** | **48.1** | 0 | Negligible | **51.9** | **52.0** | 0 | Negligible |
| **12** | **44.9** | **44.9** | 0 | Negligible | **48.4** | **48.5** | 0 | Negligible |
| **13** | **48.2** | **48.2** | 0 | Negligible | **52.2** | **52.2** | 0 | Negligible |
| **14** | **50.6** | **50.5** | 0 | Negligible | **54.9** | **54.8** | 0 | Negligible |
| **15** | **58.4** | **58.3** | 0 | Negligible | **63.6** | **63.5** | 0 | Negligible |
| **16** | **57.5** | **57.5** | 0 | Negligible | **62.6** | **62.5** | 0 | Negligible |

| Receptor | With 'Official' Emissions Reduction [c] | | | | Without Emissions Reduction [d] | | | |
|---|---|---|---|---|---|---|---|---|
| | Without Scheme | With Scheme | % Change [d] | Impact Descriptor | Without Scheme | With Scheme | % Change [e] | Impact Descriptor |
| **17** | **44.0** | **44.2** | 0 | Negligible | **47.3** | **47.5** | 1 | Moderate Adverse |
| **18** | **42.4** | **42.6** | 0 | Negligible | **45.7** | **45.8** | 0 | Negligible |
| **19** | 31.5 | 31.5 | 0 | Negligible | 33.3 | 33.3 | 0 | Negligible |
| **Objective** | **40** | | - | - | **40** | | - | - |

[a] Exceedences of the objective are shown in bold.

[b] The highest concentration from any height with relevant exposure is shown.

[c] This assumes that road vehicle emission factors reduce between 2014 and 2016 at the current 'official' rates.

[d] This assumes that road vehicle emission factors in 2016 remain the same as in 2014.

[e] % changes are relative to the objective and have been rounded to the nearest whole number.

**Table 8: Predicted Impacts on Annual Mean $PM_{10}$ Concentrations in 2016 ($\mu g/m^3$) [a]**

| Receptor | Annual Mean $PM_{10}$ ($\mu g/m^3$) | | | |
|---|---|---|---|---|
| | Without Scheme | With Scheme | % Change [b] | Impact Descriptor |
| **1** | 23.6 | 23.6 | 0 | Negligible |
| **2** | 23.3 | 23.3 | 0 | Negligible |
| **3** | 22.2 | 22.2 | 0 | Negligible |
| **4** | 23.4 | 23.4 | 0 | Negligible |
| **5** | 23.8 | 23.8 | 0 | Negligible |
| **6** | 24.7 | 24.7 | 0 | Negligible |
| **7** | 23.6 | 23.6 | 0 | Negligible |
| **8** | 21.7 | 21.8 | 0 | Negligible |
| **9** | 23.6 | 23.6 | 0 | Negligible |
| **10** | 24.0 | 24.0 | 0 | Negligible |
| **11** | 24.6 | 24.6 | 0 | Negligible |
| **12** | 24.0 | 24.0 | 0 | Negligible |
| **13** | 24.6 | 24.6 | 0 | Negligible |
| **14** | 25.1 | 25.1 | 0 | Negligible |
| **15** | 26.7 | 26.7 | 0 | Negligible |

| Receptor | Annual Mean $PM_{10}$ ($\mu g/m^3$) | | | |
|---|---|---|---|---|
| | Without Scheme | With Scheme | % Change [b] | Impact Descriptor |
| **16** | 26.5 | 26.5 | 0 | Negligible |
| **17** | 23.8 | 23.8 | 0 | Negligible |
| **18** | 23.5 | 23.6 | 0 | Negligible |
| **19** | 21.9 | 21.9 | 0 | Negligible |
| **Objective** | **32** [c] | | - | - |

[a] The highest concentration from any height with relevant exposure is shown.

[b] % changes are relative to the criterion and have been rounded to the nearest whole number.

[c] While the annual mean $PM_{10}$ objective is 40 $\mu g/m^3$, 32 $\mu g/m^3$ is the annual mean concentration above which an exceedence of the 24-hour mean $PM_{10}$ concentration is possible, as outlined in LAQM.TG(09) (Defra, 2009). A value of 32 $\mu g/m^3$ is thus used as a proxy to determine the likelihood of exceedence of the 24-hour mean $PM_{10}$ objective, as recommended in EPUK & IAQM guidance (EPUK & IAQM, 2015).

**Table 9: Predicted Impacts on Annual Mean $PM_{2.5}$ Concentrations in 2016 ($\mu g/m^3$) [a]**

| Receptor | Annual Mean $PM_{2.5}$ ($\mu g/m^3$) | | | |
|---|---|---|---|---|
| | Without Scheme | With Scheme | % Change [b] | Impact Descriptor |
| **1** | 15.9 | 15.9 | 0 | Negligible |
| **2** | 15.7 | 15.7 | 0 | Negligible |
| **3** | 15.0 | 15.0 | 0 | Negligible |
| **4** | 15.8 | 15.8 | 0 | Negligible |
| **5** | 16.0 | 16.0 | 0 | Negligible |
| **6** | 16.6 | 16.6 | 0 | Negligible |
| **7** | 15.9 | 16.0 | 0 | Negligible |
| **8** | 14.8 | 14.8 | 0 | Negligible |
| **9** | 15.9 | 16.0 | 0 | Negligible |
| **10** | 16.2 | 16.2 | 0 | Negligible |
| **11** | 16.5 | 16.5 | 0 | Negligible |
| **12** | 16.1 | 16.1 | 0 | Negligible |
| **13** | 16.5 | 16.5 | 0 | Negligible |
| **14** | 16.8 | 16.8 | 0 | Negligible |
| **15** | 17.8 | 17.8 | 0 | Negligible |
| **16** | 17.7 | 17.7 | 0 | Negligible |
| **17** | 16.1 | 16.1 | 0 | Negligible |

| Receptor | Annual Mean $PM_{2.5}$ ($\mu g/m^3$) | | | |
|---|---|---|---|---|
| | Without Scheme | With Scheme | % Change [b] | Impact Descriptor |
| **18** | 15.9 | 15.9 | 0 | Negligible |
| **19** | 14.8 | 14.8 | 0 | Negligible |
| **Objective** | **25** | | - | - |

[a] The highest concentration from any height with relevant exposure is shown.

[b] % changes are relative to the criterion and have been rounded to the nearest whole number.

### Nitrogen Dioxide With 'Official' Emissions Reduction

5.2 The predicted annual mean nitrogen dioxide concentrations are above the objective at 16 of the 19 receptor locations, whether the scheme is developed or not. These receptors are all within the AQMA.

5.3 The percentage changes in concentrations, relative to the air quality objective (when rounded), are predicted to be zero at 15 of the receptors and 1 % at the remaining four receptors. Using the matrix in Table A3.1 (Appendix A3), these impacts are described as *negligible to moderate*. It should be noted that there are some reductions in concentrations in areas along High Road north of White Hart Lane (Receptors 13-16) although these are rounded to 0% and therefore are not significant reductions. It should also be noted that these impacts are not those of the construction related traffic for the THFC development. They are the comparison of the situation without the construction compound versus that with the construction compound.

### Nitrogen Dioxide Without Emissions Reduction

5.4 Assuming no reduction in vehicle emissions, the predicted annual mean nitrogen dioxide concentrations are above the objective at 16 of the 19 receptor locations, whether the scheme is developed or not. These receptors are all within the AQMA.

5.5 The percentage changes in concentrations, relative to the air quality objective (when rounded), are predicted to be zero at 16 of the receptors and 1 % at the remaining three receptors. Using the matrix in Table A3.1 (Appendix A3), these impacts are described as *negligible to moderate.* Again, it should be noted that there are some reductions in concentrations in areas along High Road north of White Hart Lane (Receptors 13-16) although these are rounded to 0% and therefore not significant reductions. Once again, it should be noted that these impacts are not those of the construction related traffic for the THFC development. They are the comparison of the situation without construction compound versus that with the construction compound.

5.6 This scenario is based on worst-case assumptions regarding reductions in vehicle emissions and is unlikely to be realistic. In reality, some reduction in vehicle emissions between 2014 and 2016 is expected. The actual concentrations will most likely lie somewhere between this and the 'with

emissions reduction' scenarios, although by 2016 the impacts are likely to be closer to the 'without reduction' results than the 'with reduction' results.

### $PM_{10}$ and $PM_{2.5}$

5.7 The annual mean $PM_{10}$ and $PM_{2.5}$ concentrations are well below the annual mean objectives at all receptors, with or without the scheme. Furthermore, as the annual mean $PM_{10}$ concentrations are below 32 µg/$m^3$, it is unlikely that the 24-hour mean $PM_{10}$ objective will be exceeded at any of the receptors.

5.8 The percentage changes in both $PM_{10}$ and $PM_{2.5}$ concentrations, relative to the air quality objective (when rounded), are predicted to be zero at all of the receptors. Using the matrix in Table A3.1 (Appendix A3), these impacts are described as *negligible.*

## Operational Dust Impacts

### *Plant Design*

5.1 The proposed concrete batching plant will produce concrete for the THFC development until 2017. In that time, it is anticipated that 65,000 $m^3$ of concrete will be produced.

5.2 Concrete will be produced from the following raw materials, and they will be stored on site as follows:

- cement – stored in sealed silos;
- GGBS – stored in sealed silos;
- limestone fines – stored in sealed silos;
- fine and coarse aggregates – stored in ground bays; and
- water and admixture – stored in tanks.

5.3 The facility will receive all raw materials by road vehicle, except for water which will be pumped to the site via pipes. It is anticipated that a total of 80,000 $m^3$ of aggregate will be required, which will be delivered in 20 tonne (11.11 $m^3$) wagons. Aggregate is primarily made up of large grains that will not be susceptible to suspension in air, although it will undoubtedly contain some smaller particles that could become airborne. However, by the time the aggregate reaches the proposed development, it will have been handled a number of times, and thus many of these smaller particles will already have been removed. Furthermore, all conveyors at the facility used to transfer aggregate will be fitted with wind-boards to prevent wind-whipping of the aggregate; this mitigation measure is consistent with the best available techniques detailed in the Defra guidance (Defra, 2012). It will also be ensured that drop-heights of aggregates are minimised as far as possible.

5.4 The concrete production process is a “fully wet” batch process. Aggregates will be fed into the batching plant from the ground bays using a front-end loader, and then fed into the static mixer. The aggregate bays will be built so that aggregate is all stored below the level of the walls encompassing the bays, minimising the amount of wind passing over the stockpiles; this mitigation measure is consistent with the best available techniques detailed in the Defra guidance (Defra, 2012).

5.5 Cement deliveries will take place through a fully enclosed system, whereby cement powder is extracted from the delivering HGV tankers into storage silos using compressed air, generating minimal dust emissions. The silos will be fitted with dust filters and high-level and pressure sensor alarms (warning light and siren) linked to automatic shut-off valves on the fill pipe, and are thus considered to be consistent with the best available techniques detailed in the Defra guidance (Defra, 2012). From the silos, the cement will then be screwed into a weigh-hopper and then discharged into a static mixer.

5.6 Water and admixture will then be weighed and added to the static mixer. The final wet concrete will then be discharged into mixer trucks for transportation to the main development site. This liquid concrete will not generate any dust.

5.7 It is understood that the site will be paved, with no unpaved ground over which HGVs can travel. Coupled with the low dust emission potential of the on-site process, it is unlikely that dust and dirt will be tracked out onto the local roads. Nevertheless, a road-sweeper will be utilised at the site, which is considered a suitable alternative to a wheel-wash system as suggested in the Defra guidance (Defra, 2012).

5.8 In summary, the facility will be designed to include all of the control technology necessary to ensure that dust emissions are kept to an absolute minimum, following the best available techniques outlined in Defra’s Statutory Guidance for Blending, Packing, Loading, Unloading and Use of Cement (Defra, 2012). The plant will also adhere to all of the particulate matter emission limits set out in the guidance document.

### *Potential for Dust Impacts*

5.9 This section considers the dust generation potential of the proposed development, and the likelihood that the dust generated will lead to impacts at the nearest sensitive receptors. The nearest residential properties to the site boundary lie approximately 26 m to the south of the site.

5.10 In adapting and using the IAQM’s construction dust assessment methodology (Institute of Air Quality Management, 2014) (see Appendix A2 for further details), the first step is to screen the need for an assessment. There are no sensitive ecological sites within 50 m of the proposed development, and thus there is no requirement for an assessment of the impacts of dust emissions

on nearby ecological sites. However, there are sensitive human receptors within 350 m of the site boundary, and thus the potential for impacts upon these receptors requires assessment.

5.11 The next step is to consider the potential dust emission magnitude of the site. Given that the site will be built to incorporate the necessary best available techniques for dust emission abatement, as outlined above, it is considered appropriate to assume that, in comparison to a typical construction site, the dust emission magnitude of the proposed development will be 'small'.

5.12 The next step is to define the sensitivity of the area. There are estimated to be more than 100 residential buildings within 100 m of the site boundary. Using the matrix in Table A2.3, the area surrounding the onsite works is currently of 'medium' sensitivity to dust soiling effects.

5.13 The matrix in Table A2.4 requires information on the baseline annual mean $PM_{10}$ concentration in the area. It is considered that the existing annual mean $PM_{10}$ concentration is best described by the background concentration from Table 4. Using the matrix in Table A2.4, the area surrounding the onsite works is of 'low' sensitivity to human health effects.

5.14 The risk of impacts can now be defined, using the dust emission magnitude and area sensitivities outlined above. Using the matrix applicable to demolition in Table A2.6, which is the most conservative, the risk of impacts would be defined as 'Negligible' in terms of human health impacts, and 'Low Risk' in terms of dust soiling impacts. Given the cautious approach of this assessment, and considering the processes used and abatement measures already in place, it is considered highly unlikely that the proposed facility will lead to significant dust impacts at any nearby sensitive receptors.

## Significance of Traffic Air Quality Impacts

5.15 The local air quality impacts of the construction compound related traffic, without mitigation, are judged to be *significant*. This professional judgement is made in accordance with the methodology set out in Appendix A3, and also takes into account the uncertainty over future projections of traffic-related nitrogen dioxide concentrations, which may not decline as rapidly as expected. The latter has been addressed by giving consideration to both sets of modelled results for nitrogen dioxide; those with and without reductions in traffic emissions. It is expected that concentrations will fall in the range between the two sets of results, although by 2016 the impacts are likely to be closer to the 'without reduction' results than the 'with reduction' results.

5.16 More specifically, the judgement that the air quality impacts of the construction compound will be *significant* without mitigation takes account of the assessment that concentrations are predicted to remain above the objective at the majority of the receptor locations, and the impacts, while mostly negligible, will be moderate adverse at a number of receptors, in particular along White Hart Lane.

5.17 While this assessment has focused on those areas where adverse impacts are expected, it is noted that overall the scheme will reduce the distance over which concrete mixer trucks will have

to travel across the borough. It is thus likely that there will be beneficial air quality impacts over the wider area. Furthermore, the impacts will be temporary with the batching plant operation ceasing in 2017, and thus the impacts will be eliminated following decommissioning of the plant.

# 6 Mitigation

## Road Traffic Impacts

6.1 The assessment has demonstrated that the scheme will not cause any exceedences of the air quality objectives in areas where they are not currently exceeded. Furthermore, any impacts will be both localised and temporary. The construction related traffic is expected to conform to the Euro VI emission standards. This will reduce the impacts below those set out above. It is not considered essential to provide any additional mitigation. It may be possible to minimise the impacts by using hybrid or electric vehicles to transport the concrete from the construction site to the THFC development site. The feasibility of this is unknown and would need to be investigated; electric HGVs for movement of concrete may not be available commercially.

## Operational Dust Impacts

6.2 The proposed development will operate to the strict best available techniques outlined in the Defra guidance (Defra, 2012). These include a range of measures to ensure that there are no significant releases to air. It is anticipated that these measures will be sufficient to ensure that the proposed development has a negligible impact on sensitive receptors in the local area. It is thus not considered necessary to propose further mitigation.

# 7 Conclusions

7.1 The proposed compound will include a number of abatement measures that will ensure that there are no significant emissions to air of dust or particulate matter. The site will need to be approved by the Local Authority, who will be able to ensure that the abatement measures are adequate, and that they are suitably maintained, so as to ensure no adverse impacts on nearby sensitive receptors. The proposed development will adhere to the statutory guidance (Defra, 2012) on blending, packing, loading, unloading and use of cement issued by Defra, and it can thus be assumed that the site will not generate any significant dust emissions.

7.2 The localised adverse impacts of increased traffic emissions on White Hart Lane and High Road south of White Hart Lane, along with the small beneficial impacts along High Road north of White Hart Lane, due to decreases in THFC construction traffic, have been assessed. Concentrations have been modelled for 19 worst-case receptors, representing existing properties where impacts are expected to be greatest. In the case of nitrogen dioxide, the modelling has been carried out assuming both that vehicle emissions decrease (using 'official' emission factors), and that they do not decrease in future years. This is to allow for uncertainty over emission factors for nitrogen oxides identified by Defra (Carslaw et al., 2011).

7.3 It is concluded that concentrations of $PM_{10}$ and $PM_{2.5}$ will remain below the objectives at all existing receptors in 2016, whether the construction compound is utilised or not. This conclusion is consistent with the outcomes of the reviews and assessments prepared by the LB of Haringey, which show that exceedences of the $PM_{10}$ objective are unlikely at any location.

7.4 In the case of nitrogen dioxide, the annual mean concentrations will remain above the objective at 16 of the 19 existing receptors in 2016, whether the construction compound is utilised or not, and whether or not a reduction in vehicle emissions of nitrogen oxides is assumed.

7.5 The maximum daily average construction related traffic for the THFC site (assuming no construction compound) on High Road, of 41 HGVs, leads to a moderate adverse impact at locations along High Road. Use of the construction compound will lead to a small reduction in HGV movements along High Road north of White Hart Lane; this is unlikely, however, to remove the moderate adverse impacts. The additional traffic along White Hart Lane will introduce new adverse impacts along this road.

7.6 The traffic generated by the proposed development will affect air quality at existing properties along the local road network. The assessment has demonstrated that the changes in concentrations of $PM_{10}$ and $PM_{2.5}$ at relevant locations relative to the objectives will be 0% (when rounded) and the impacts will all be *negligible*. In the case of nitrogen dioxide, the percentage changes are predicted to range from 0% to 1%, and the impacts will range from *negligible* to *moderate adverse*. The duration of any impacts will be short, since the scheme is only temporary.

It should be noted that there are some reductions in concentrations in areas along High Road north of White Hart Lane (Receptors 13-16), although these are rounded to 0% and therefore not significant reductions. It should also be noted that the impacts detailed in this report are not those of the construction related traffic for the THFC development. They are the comparison of the situation without the construction compound versus that with the construction compound. The localised adverse impacts of the development relative to there being no construction compound are judged to be *significant*. This conclusion, which takes account of the uncertainties in future projections, in particular for nitrogen dioxide, is based on the anticipated duration of the impacts, and the fact that the scheme will not cause any exceedences of any objective in areas where they are not already exceeded.

7.7 While this assessment has focused on those areas where adverse impacts are expected due to the use of the construction compound, it is noted that overall the scheme will reduce the distance over which concrete mixer trucks will have to travel across the borough. It is thus likely that there will be beneficial air quality impacts over the wider area.

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# 9 Glossary

| | |
|---|---|
| **AADT** | Annual Average Daily Traffic |
| **ADMS-Roads** | Atmospheric Dispersion Modelling System model for Roads |
| **AQC** | Air Quality Consultants |
| **AQAL** | Air Quality Assessment Level |
| **AQMA** | Air Quality Management Area |
| **AURN** | Automatic Urban and Rural Network |
| **DCLG** | Department for Communities and Local Government |
| **Defra** | Department for Environment, Food and Rural Affairs |
| **DfT** | Department for Transport |
| **DMP** | Dust Management Plan |
| **EFT** | Emission Factor Toolkit |
| **EPUK** | Environmental Protection UK |
| **Exceedence** | A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure |
| **HDV** | Heavy Duty Vehicles (> 3.5 tonnes) |
| **HGV** | Heavy Goods Vehicle |
| **IAQM** | Institute of Air Quality Management |
| **LAQM** | Local Air Quality Management |
| **LB** | London Borough |
| **LDV** | Light Duty Vehicles (<3.5 tonnes) |
| **LEZ** | Low Emission Zone |
| **µg/m$^3$** | Microgrammes per cubic metre |
| **MAQS** | Mayor's Air Quality Strategy |
| **NRMM** | Non-road Mobile Machinery |
| **NO** | Nitric oxide |
| **$NO_2$** | Nitrogen dioxide |
| **NOx** | Nitrogen oxides (taken to be $NO_2$ + NO) |

| | |
|---|---|
| **NPPF** | National Planning Policy Framework |
| **Objectives** | A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides |
| **$PM_{10}$** | Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter |
| **$PM_{2.5}$** | Small airborne particles less than 2.5 micrometres in aerodynamic diameter |
| **PPG** | Planning Practice Guidance |
| **SPG** | Supplementary Planning Guidance |
| **SPD** | Supplementary Planning Document |
| **Standards** | A nationally defined set of concentrations for nine pollutants below which health effects do not occur or are minimal |
| **TEA** | Triethanolamine – used to absorb nitrogen dioxide |
| **ULEZ** | Ultra Low Emission Zone |

# 10 Appendices

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# A1 London-Specific Policies and Measures

## London Plan

A1.1 The London Plan sets out the following points in relation to planning decisions:

*"Development proposals should:*

*a) minimise increased exposure to existing poor air quality and make provision to address local problems of air quality (particularly within AQMAs or where development is likely to be used by large numbers of those particularly vulnerable to poor air quality, such as children or older people) such by design solutions, buffer zones or steps to promote greater use of sustainable transport modes through travel plans (see Policy 6.3);*

*b) promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils "The control, of dust and emissions form construction and demolition";*

*c) be at least "air quality neutral" and not lead to further deterioration of existing poor air quality (such as areas designated as Air Quality Management Areas (AQMAs));*

*d) ensure that where provision needs to made to reduce emissions from a development, these usually are made on site. Where it can be demonstrated that on-sire provision is impractical or inappropriate, and that it is possible to put in place measures having clearly demonstrated equivalent air quality benefits, planning obligations or planning conditions should be used as appropriate to ensure this, whether on a scheme by scheme basis or through joint area-based approaches;*

*e) where the development requires a detailed air quality assessment and biomass boilers are included, the assessment should forecast pollutant concentrations. Permission should only be granted if no adverse air quality impacts from the biomass boiler are identified."*

## The Mayor's Air Quality Strategy

A1.2 The Mayor's Air Quality Strategy commits to the continuation of measures identified in the 2002 MAQS, and sets out a series of additional measures, including:

*Policy 1 – Encouraging smarter choices and sustainable travel;*

*Measures to reduce emissions from idling vehicles focusing on buses, taxis, coaches, taxis, PHVs and delivery vehicles;*

*Using spatial planning powers to support a shift to public transport;*

*Supporting car free developments.*

*Policy 2 – Promoting technological change and cleaner vehicles:*

*Supporting the uptake of cleaner vehicles.*

*Policy 4 – Reducing emissions from public transport:*

*Introducing age limits for taxis and PHVs.*

*Policy 5 – Schemes that control emissions to air:*

*Implementing Phases 3 and 4 of the LEZ from January 2012*

*Introducing a NOx emissions standard (Euro IV) into the LEZ for Heavy Goods Vehicles (HGVs), buses and coaches, from 2015.*

*Policy 7 – Using the planning process to improve air quality:*

*Minimising increased exposure to poor air quality, particularly within AQMAs or where a development is likely to be used by a large number of people who are particularly vulnerable to air quality;*

*Ensuring air quality benefits are realised through planning conditions and section 106 agreements and Community Infrastructure Levy.*

*Policy 8 – Creating opportunities between low to zero carbon energy supply for London and air quality impacts:*

*Applying emissions limits for biomass boilers across London;*

*Requiring an emissions assessment to be included at the planning application stage.*

### *Low Emission Zone (LEZ)*

A1.3 A key measure to improve air quality in Greater London is the Low Emission Zone (LEZ). This entails charges for vehicles entering Greater London not meeting certain emissions criteria, and affects older, diesel-engined lorries, buses, coaches, large vans, minibuses and other specialist vehicles derived from lorries and vans. The LEZ was introduced on 4th February 2008, and was phased in through to January 2012. From January 2012 a standard of Euro IV was implemented for lorries and other specialist diesel vehicles over 3.5 tonnes, and buses and coaches over 5 tonnes. Cars and lighter Light Goods Vehicles (LGVs) are excluded. The third phase of the LEZ, which applies to larger vans, minibuses and other specialist diesel vehicles, was also implemented in January 2012. As set out in the 2010 MAQS, a NOx emissions standard (Euro IV) is included in the LEZ for HGVs, buses and coaches, from 2015.

### *Ultra Low Emission Zone (ULEZ)*

A1.4 The Mayor has confirmed the introduction of the Ultra Low Emission Zone (ULEZ) in the Capital on 7 September 2020. The ULEZ will operate 24 hours a day, 7 days a week in the same area as the current Congestion Charging zone. All cars, motorcycles, vans, minibuses and Heavy Goods Vehicles will need to meet exhaust emission standards (ULEZ standards) or pay an additional daily charge to travel within the zone. The ULEZ standards are Euro 3 for motorcycles; Euro 4 for petrol cars, vans and minibuses; Euro 6 for diesel cars, vans and minibuses; and Euro VI for HGVs, buses and coaches.

# A2 Construction Dust Assessment Procedure

A2.1 The criteria developed by IAQM, upon which the GLA's guidance is based, divide the activities on construction sites into four types to reflect their different potential impacts. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

A2.2 The assessment procedure includes the four steps summarised below:

## STEP 1: Screen the Need for a Detailed Assessment

A2.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A2.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

## STEP 2: Assess the Risk of Dust Impacts

A2.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A2.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

### *Step 2A – Define the Potential Dust Emission Magnitude*

A2.7 Dust emission magnitude is defined as either 'Small', 'Medium', or 'Large'. The IAQM explains that this classification should be based on professional judgement, but provides the examples in Table Table A2.1.

**Table A2.1: Examples of How the Dust Emission Magnitude Class May be Defined**

| Class | Examples |
|---|---|
| **Demolition** | |
| **Large** | Total building volume >50,000 $m^3$, potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level |
| **Medium** | Total building volume 20,000 $m^3$ – 50,000 $m^3$, potentially dusty construction material, demolition activities 10-20 m above ground level |
| **Small** | Total building volume <20,000 $m^3$, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months |
| **Earthworks** | |
| **Large** | Total site area >10,000 $m^2$, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes |
| **Medium** | Total site area 2,500 $m^2$ – 10,000 $m^2$, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes |
| **Small** | Total site area <2,500 $m^2$, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months |
| **Construction** | |
| **Large** | Total building volume >100,000 $m^3$, piling, on site concrete batching; sandblasting |
| **Medium** | Total building volume 25,000 $m^3$ – 100,000 $m^3$, potentially dusty construction material (e.g. concrete), piling, on site concrete batching |
| **Small** | Total building volume <25,000 $m^3$, construction material with low potential for dust release (e.g. metal cladding or timber) |
| **Trackout** [a] | |
| **Large** | >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m |
| **Medium** | 10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m |
| **Small** | <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m |

[a] These numbers are for vehicles that leave the site after moving over unpaved ground.

### *Step 2B – Define the Sensitivity of the Area*

A2.8 The sensitivity of the area is defined taking account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of $PM_{10}$, the local background concentration; and
- site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

A2.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM recommends that this should be based on professional judgment, taking account of the principles in Table A2.2. These receptor sensitivities are then used in the matrices set out in Table A2.3, Table A2.4 and Table A2.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

### *Step 2C – Define the Risk of Impacts*

A2.10 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM provides the matrix in Table A2.6 as a method of assigning the level of risk for each activity.

## STEP 3: Determine Site-specific Mitigation Requirements

A2.11 The IAQM provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided by the IAQM has been used as the basis for the requirements set out in Appendix A6.

## STEP 4: Determine Significant Effects

A2.12 The IAQM does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant' (Institute of Air Quality Management, 2014).

A2.13 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

**Table A2.2: Principles to be Used When Defining Receptor Sensitivities**

| Class | Principles | Examples |
|---|---|---|
| **Sensitivities of People to Dust Soiling Effects** | | |
| **High** | users can reasonably expect enjoyment of a high level of amenity; or<br>the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land | dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms |
| **Medium** | users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or<br>the appearance, aesthetics or value of their property could be diminished by soiling; or<br>the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land | parks and places of work |
| **Low** | the enjoyment of amenity would not reasonably be expected; or<br>there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or<br>there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land | playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads |
| **Sensitivities of People to the Health Effects of $PM_{10}$** | | |
| **High** | locations where members of the public may be exposed for eight hours or more in a day | residential properties, hospitals, schools and residential care homes |
| **Medium** | locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day. | may include office and shop workers, but will generally not include workers occupationally exposed to $PM_{10}$ |
| **Low** | locations where human exposure is transient | public footpaths, playing fields, parks and shopping streets |
| **Sensitivities of Receptors to Ecological Effects** | | |
| **High** | locations with an international or national designation and the designated features may be affected by dust soiling; or<br>locations where there is a community of a particularly dust sensitive species | Special Areas of Conservation with dust sensitive features |
| **Medium** | locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or<br>locations with a national designation where the features may be affected by dust deposition | Sites of Special Scientific Interest with dust sensitive features |
| **Low** | locations with a local designation where the features may be affected by dust deposition | Local Nature Reserves with dust sensitive features |

**Table A2.3: Sensitivity of the Area to Effects on People and Property from Dust Soiling [4]**

| Receptor Sensitivity | Number of Receptors | Distance from the Source (m) | | | |
|---|---|---|---|---|---|
| | | <20 | <50 | <100 | <350 |
| High | >100 | High | High | Medium | Low |
| | 10-100 | High | Medium | Low | Low |
| | 1-10 | Medium | Low | Low | Low |
| Medium | >1 | Low | Low | Low | Low |
| Low | >1 | Low | Low | Low | Low |

**Table A2.4: Sensitivity of the Area to Human Health Effects [4]**

| Receptor Sensitivity | Annual Mean $PM_{10}$ | Number of Receptors | Distance from the Source (m) | | | | |
|---|---|---|---|---|---|---|---|
| | | | <20 | <50 | <100 | <200 | <350 |
| High | >32 µg/m$^3$ | >100 | High | High | High | Medium | Low |
| | | 10-100 | High | High | Medium | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 28-32 µg/m$^3$ | >100 | High | High | Medium | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 24-28 µg/m$^3$ | >100 | High | Medium | Low | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | Medium | Low | Low | Low | Low |
| | <24 µg/m$^3$ | >100 | Medium | Low | Low | Low | Low |
| | | 10-100 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Medium | - | >10 | High | Medium | Low | Low | Low |
| | - | 1-10 | Medium | Low | Low | Low | Low |
| Low | - | >1 | Low | Low | Low | Low | Low |

[4] For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

**Table A2.5: Sensitivity of the Area to Ecological Effects [4]**

| Receptor Sensitivity | Distance from the Source (m) | |
|---|---|---|
| | <20 | <50 |
| High | High | Medium |
| Medium | Medium | Low |
| Low | Low | Low |

**Table A2.6: Defining the Risk of Dust Impacts**

| Sensitivity of the Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | Large | Medium | Small |
| **Demolition** | | | |
| High | High Risk | Medium Risk | Medium Risk |
| Medium | High Risk | Medium Risk | Low Risk |
| Low | Medium Risk | Low Risk | Negligible |
| **Earthworks** | | | |
| High | High Risk | Medium Risk | Low Risk |
| Medium | Medium Risk | Medium Risk | Low Risk |
| Low | Low Risk | Low Risk | Negligible |
| **Construction** | | | |
| High | High Risk | Medium Risk | Low Risk |
| Medium | Medium Risk | Medium Risk | Low Risk |
| Low | Low Risk | Low Risk | Negligible |
| **Trackout** | | | |
| High | High Risk | Medium Risk | Low Risk |
| Medium | Medium Risk | Low Risk | Negligible |
| Low | Low Risk | Low Risk | Negligible |

# A3 EPUK & IAQM Planning for Air Quality Guidance

A3.1 The guidance issued by EPUK and IAQM[5] (EPUK & IAQM, 2015) is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

### *Air quality as a material consideration*

*"Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:*

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations".*
-

### *Screening*

#### Impacts of the Local Area on the Development

*"There may be a requirement to carry out an air quality assessment for the impacts of the local area's emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:*

- *the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development".*

[5] The IAQM is the professional body for air quality practitioners in the UK.

### Impacts of the Development on the Local Area

A3.2 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the follow apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use;
- more than 1,000 $m^2$ of floor space for all other uses or a site area greater than 1 ha.

A3.3 Coupled with any of the following:

- the development has more than 10 parking spaces;
- the development will have a centralised energy facility or other centralised combustion process.

A3.4 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, the criteria for which are set out below. The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria is likely to be more appropriate.

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;
- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights, or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor;
- the development will have one or more substantial combustion processes where the combustion unit is:
    - any centralised plant using bio fuel;

- any combustion plant with single or combined thermal input >300 kW; or
- a standby emergency generator associated with a centralised energy centre (if likely to be tested/used >18 hours a year).

- the development will have a combustion unit of any size where emissions are at a height that may give rise to impacts through insufficient dispersion, e.g. through nearby buildings.

A3.5 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area.

A3.6 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this report.

## Impact Descriptors and Assessment of Significance

A3.7 There is no official guidance in the UK on how to describe the nature of air quality impacts, nor how to assess their significance. The approach developed by EPUK and IAQM[6] (EPUK & IAQM, 2015) has therefore been used. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

### *Impact Descriptors*

A3.8 Impact description involves expressing the magnitude of incremental change as a proportion of a relevant assessment level and then examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table A3.1 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. For the assessment criterion the term Air Quality Assessment Level or AQAL has been adopted, as it covers all pollutants, i.e. those with and without formal standards. Typically, as is the case for this assessment, the AQAL will be the air quality objective value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

[6] The IAQM is the professional body for air quality practitioners in the UK.

**Table A3.1: Air Quality Impact Descriptors for Individual Receptors for All Pollutants [a]**

| Long-Term Average Concentration At Receptor In Assessment Year [b] | Change in concentration relative to AQAL [c] | | | | |
|---|---|---|---|---|---|
| | 0% | 1% | 2-5% | 6-10% | >10% |
| 75% or less of AQAL | Negligible | Negligible | Negligible | Slight | Moderate |
| 76-94% of AQAL | Negligible | Negligible | Slight | Moderate | Moderate |
| 95-102% of AQAL | Negligible | Slight | Moderate | Moderate | Substantial |
| 103-109% of AQAL | Negligible | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQAL | Negligible | Moderate | Substantial | Substantial | Substantial |

[a] Values are rounded to the nearest whole number.

[b] This is the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme' concentration where there is an increase.

[c] AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

## *Assessment of Significance*

A3.9 The IAQM guidance (EPUK & IAQM, 2015) is that the assessment of significance should be based on professional judgement, with the overall air quality impact of the scheme described as either significant or not significant. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as 'slight' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

A3.10 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality

objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.

A3.11 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in Appendix A4.

# A4 Professional Experience

## Dr Ben Marner, BSc (Hons) PhD CSci MIEnvSc MIAQM

Dr Marner is a Technical Director with AQC, and has over fifteen years' experience in the field of air quality. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has been an expert witness at several public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has extensive experience of using detailed dispersion models, as well as contributing to the development of modelling best practices. Dr Marner has arranged and overseen air quality monitoring surveys, as well as contributing to Defra guidance on harmonising monitoring methods. He has been responsible for air quality review and assessments on behalf of numerous local authorities. He has also developed methods to predict nitrogen deposition fluxes on behalf of the Environment Agency, provided support and advice to the UK Government's air quality review and assessment helpdesk, Transport Scotland, Transport for London, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist.

## Kieran Laxen, MEng (Hons) AMIEnvSc MIAQM

Mr Laxen is a Senior Consultant with AQC with over six years' experience in the field of air quality management and assessment. Previously having two years' experience in scientific research on internal combustion engines, he now works in the field of air quality. He is involved in a wide range of development projects, most of which have involved use of ADMS modelling methodologies for biomass boilers, CHP plant and roads, and is also competent in the assessment of construction dust. He has pioneered the use of OpenAir software within the Company, which is used to analyse air quality monitoring data, and is responsible for routine calibration of air quality monitoring stations, together with data ratification. He is a Member of the Institute of Air Quality Management.

## Paul Outen, BSc (Hons)

Mr Outen is a Consultant with AQC, having joined in 2014. He holds a degree in Environmental Geoscience, having specialised in the study of landfill-related particulate matter for his final year thesis. Prior to joining AQC he worked as an Air Quality Consultant at Odournet UK Ltd for 6 years, undertaking a range of air quality and odour assessments across a number of different industries, as well as managing the sampling/technical department for the company. He now undertakes air quality assessments at AQC, utilising the ADMS dispersion models to assess the impacts of a variety of sources on concentrations of nitrogen dioxide, $PM_{10}$ and $PM_{2.5}$.

Full CVs are available at www.aqconsultants.co.uk.

# A5 Modelling Methodology

## Background Concentrations

A5.1 The background pollutant concentrations across the study area have been defined using the national pollution maps published by Defra (2015b). These cover the whole country on a 1x1 km grid and are published for each year from 2011 until 2030. The maps include the influence of emissions from a range of different sources; one of which is road traffic. As noted in Paragraph 3.13, there is evidence that the current 'official' emissions factors published by Defra may over-predicted the rate at which road traffic emissions of nitrogen oxides will fall in the future. The maps currently in use were verified against measurements made during 2011 at a large number of automatic monitoring stations and so there can be reasonable confidence that the maps are representative of conditions during 2011. Similarly, there is reasonable confidence that the reductions which Defra predicts from other sectors (e.g. rail) will be achieved.

A5.2 In order to calculate background nitrogen dioxide and nitrogen oxides concentrations in 2014, it is assumed that there was no reduction in the road traffic component of backgrounds between 2011[7] and 2014. This has been done using the source-specific background nitrogen oxides maps provided by Defra (2015b). For each grid square, the road traffic component has been held constant at 2011 levels, while 2014 values have been taken for the other components. Nitrogen dioxide concentrations have then been calculated using the background nitrogen dioxide calculator which Defra (2015b) publishes to accompany the maps. The result is a set of 'adjusted 2014 background' concentrations.

A5.3 As an additional step, the 'adjusted 2014 background' mapped nitrogen dioxide values have been plotted against national background measurements made as part of the AURN (Defra, 2015d) during 2014 (see Figure A5.1). Based on the 40 sites with more than 75% data capture for 2014, the maps show an almost 1:1 relationship, being just 0.2% different. Thus no further adjustment has been applied to the 'adjusted' 2014 background concentrations and 2016 background concentrations.

[7] This approach assumes that there has been no reduction in emissions per vehicle, but that traffic volumes have remained constant. This is not the same as the assumption made for dispersion modelling, in which emissions per vehicle are held constant while traffic volumes are assumed to change year on year. This discrepancy is unlikely to influence the overall conclusions of the assessment.

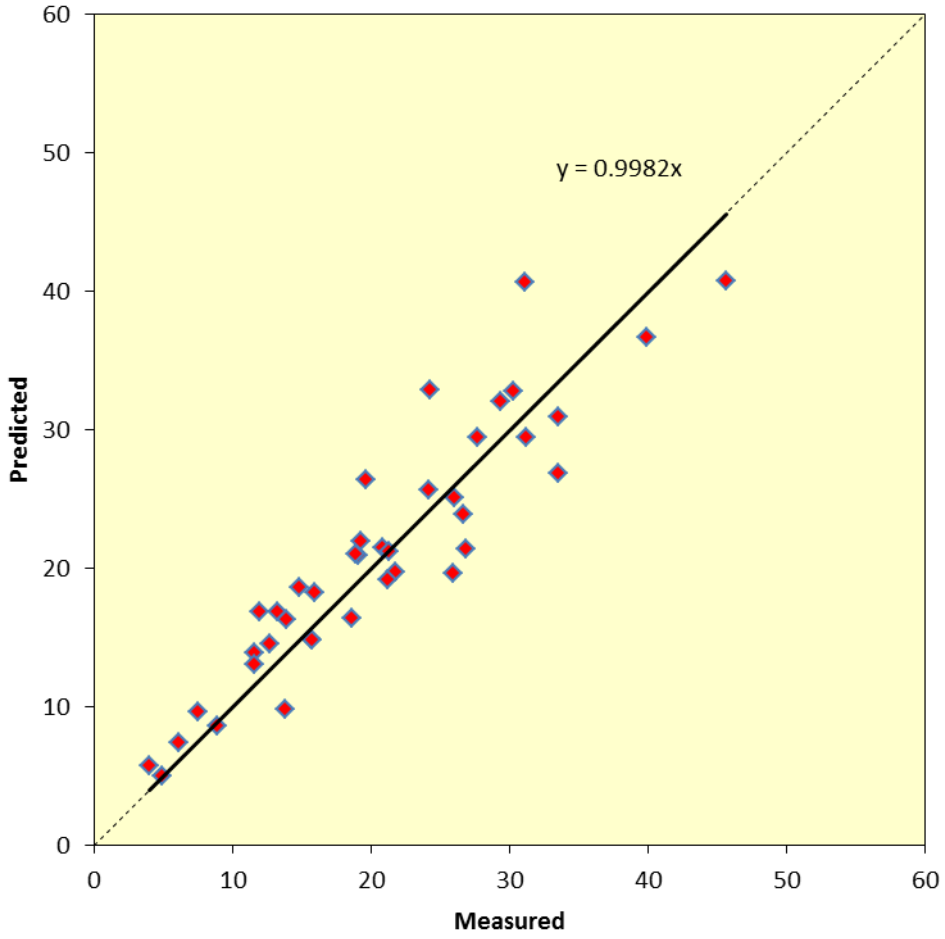


**Figure A5.1: Predicted Mapped versus Measured $NO_2$ Concentrations at AURN Background Sites in 2014**

A5.4 Two separate sets of 2016 background nitrogen dioxide and nitrogen oxides concentrations have been used for the future-year assessment. The 2016 background 'without emissions reduction' has been calculated using the same approach as described for the 2014 data: the road traffic component of background nitrogen oxides has been held constant at 2011 values, while 2016 data are taken for the other components. Nitrogen dioxide has then been calculated using Defra's background nitrogen dioxide calculator. The 2016 background 'with emissions reduction' assumes that Defra's revised predicted reductions occur from 2014 onward. This dataset has been derived first by calculating the ratio of the unadjusted mapped value for 2016 to the unadjusted mapped value for 2014. This ratio has then been applied to the adjusted 2014 value (as derived in Paragraph A5.2).

A5.5 For $PM_{10}$ and $PM_{2.5}$, there is no strong evidence that Defra's predictions are unrealistic and so the year-specific mapped concentrations have been used in this assessment.

## Model Inputs

### *Road Traffic*

A5.6 Predictions have been carried out using the ADMS-Roads dispersion model (v3.4). The model requires the user to provide various input data, including emissions from each section of road, and the road characteristics (including road width and street canyon height, where applicable). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the Emission Factor Toolkit (Version 6.0.2) published by Defra (2015b). For nitrogen dioxide, future-year concentrations have been predicted once using year-specific emission factors from the EFT, and once using emission factors for 2014[8], which is the year for which the model has been verified.

A5.7 The model has been run using the full year of meteorological data that corresponds to the most recent set of nitrogen dioxide monitoring data (2014). The meteorological data has been taken from the monitoring station located at Northolt, which is considered suitable for this area.

A5.8 For the purposes of modelling, it has been assumed that the front façades of a number of existing properties are within a street canyon formed by the buildings on White Hart Lane and High Road. This road has a number of canyon-like features, which reduce dispersion of traffic emissions, and can therefore lead to concentrations of pollutants being higher here than they would be in areas with greater dispersion. These roads are not full canyons however, as there are gaps between buildings allowing a reasonable level of near-road dispersion. As a precautionary measure, the canyon-like sections of these roads has been assumed to be canyons and ADMS-roads may therefore have over predicted concentrations at the façades of the properties in these areas.

A5.9 AADT flows, diurnal flow profiles, speeds, and vehicle fleet composition data have been provided by Tim Spencer and Co who prepared the Transport Assessment. Traffic data have been provided for all the scenarios. Baseline traffic data have been derived from 24 hour counts at 20 locations within the local area in 2015. These traffic counts were taken on a non-event day and therefore do not include the contribution to the annual average daily flows of the event-day traffic. The one day traffic counts have been adjusted to represent annual average daily traffic (AADT) flows using DfT adjustment factors for typical urban areas, taking account of the time of year the counts were carried out.

A5.10 An event-day cordon analysis has been carried out by Tim Spencer and Co. This analysis compared the number of trips that arrived/departed an area of within approximately 1 km of the development per year. This has been based on the number of trips per event multiplied by the frequency of events. This annual trip generation has been compared with the total number of trips predicted on the main local roads for non-event days within 1 km of development (39,154,158 trips) to calculate the ratio of event related traffic to non-event related traffic as an annual factor. Based

[8] i.e. combining current-year emission factors with future-year traffic data.

on 30 events this factor is 1.066 assuming a trip rate per event of 8,550 (30 x 8,550 / 39,154,158). This is assumed to be the existing situation given 30 events per year.

A5.11 The uplift factor of 1.066 has been applied to the baseline 2015 traffic flows. The resultant baseline traffic data set represents AADT flows including the existing stadium related event-day traffic.

A5.12 Tim Spencer and Co have identified that traffic flows on local roads have been fairly constant over recent years, and if anything reducing. Therefore as a worst-case this 2015 baseline traffic dataset has been taken to represent both 2014 and future year baseline traffic data.

A5.13 The 2016 "without development" traffic datasets include the construction traffic generated by the THFC development assuming that concrete batching is undertaken at the main development site, and also imported from elsewhere. The 2016 "with development" datasets assume that the concrete batching within the construction compound at White Hart Lane is fully operational, and that no concrete batching is undertaken elsewhere. The construction traffic generation and flow distribution has been provided by Tim Spencer and Co. The traffic flows used in the assessment are provided in Table A5.1, and the modelled road links are shown in Figure A5.2.

**Table A5.1: Summary of Traffic Data used in the Assessment (AADT)**

| Road Link | 2014 | | 2016 (Without Scheme) | | 2016 (With Scheme) | |
|---|---|---|---|---|---|---|
| | AADT | %HDV | AADT | %HDV | AADT | %HDV |
| **1** | 21,592 | 6.9 | 21,634 | 7.0 | 21,623 | 7.0 |
| **2** | 21,592 | 6.9 | 21,634 | 7.0 | 21,623 | 7.0 |
| **3** | 21,592 | 6.9 | 21,634 | 7.0 | 21,623 | 7.0 |
| **4** | 17,772 | 7.8 | 17,814 | 8.0 | 17,803 | 7.9 |
| **5** | 18,088 | 7.6 | 18,129 | 7.9 | 18,118 | 7.8 |
| **6** | 18,088 | 7.0 | 18,129 | 7.2 | 18,146 | 7.3 |
| **7** | 18,088 | 7.0 | 18,129 | 7.2 | 18,146 | 7.3 |
| **8** | 18,088 | 7.0 | 18,088 | 7.0 | 18,088 | 7.0 |
| **9** | 17,125 | 8.5 | 17,125 | 8.5 | 17,125 | 8.5 |
| **10** | 17,125 | 8.5 | 17,125 | 8.5 | 17,125 | 8.5 |
| **11** | 17,125 | 8.5 | 17,125 | 8.5 | 17,125 | 8.5 |
| **12** | 17,125 | 8.5 | 17,125 | 8.5 | 17,125 | 8.5 |
| **13** | 16,499 | 10.8 | 16,499 | 10.8 | 16,499 | 10.8 |
| **14** | 16,499 | 10.8 | 16,499 | 10.8 | 16,499 | 10.8 |

| Road Link | 2014 | | 2016 (Without Scheme) | | 2016 (With Scheme) | |
|---|---|---|---|---|---|---|
| | AADT | %HDV | AADT | %HDV | AADT | %HDV |
| **15** | 16,499 | 10.8 | 16,499 | 10.8 | 16,499 | 10.8 |
| **16** | 11,673 | 6.2 | 11,673 | 6.2 | 11,673 | 6.2 |
| **17** | 11,673 | 6.2 | 11,673 | 6.2 | 11,673 | 6.2 |
| **18** | 14,092 | 2.8 | 14,092 | 2.8 | 14,092 | 2.8 |
| **19** | 14,092 | 2.8 | 14,092 | 2.8 | 14,092 | 2.8 |
| **20** | 1,970 | 2.4 | 1,970 | 2.4 | 1,970 | 2.4 |
| **21** | 1,970 | 2.4 | 1,970 | 2.4 | 1,970 | 2.4 |
| **22** | 12,318 | 4.1 | 12,318 | 4.1 | 12,345 | 4.4 |
| **23** | 12,318 | 4.1 | 12,318 | 4.1 | 12,345 | 4.4 |
| **24** | 12,318 | 4.1 | 12,318 | 4.1 | 12,318 | 4.1 |
| **25** | 14,056 | 4.7 | 14,056 | 4.7 | 14,056 | 4.7 |
| **26** | 14,056 | 4.7 | 14,056 | 4.7 | 14,056 | 4.7 |
| **27** | 18,088 | 7.6 | 18,129 | 7.9 | 18,118 | 7.8 |
| **28** | 12,318 | 4.1 | 12,318 | 4.1 | 12,345 | 4.4 |
| **29** | 18,088 | 7.0 | 18,129 | 7.2 | 18,146 | 7.3 |
| **30** | 6,785 | 7.3 | 6,785 | 7.3 | 6,785 | 7.3 |
| **31** | 6,785 | 7.3 | 6,785 | 7.3 | 6,785 | 7.3 |
| **32** | 1,274 | 1.6 | 1,274 | 1.6 | 1,274 | 1.6 |
| **33** | 1,274 | 1.6 | 1,274 | 1.6 | 1,274 | 1.6 |
| **34** | 1,274 | 1.6 | 1,274 | 1.6 | 1,274 | 1.6 |
| **35** | 1,274 | 1.6 | 1,274 | 1.6 | 1,274 | 1.6 |
| **36** | 7,156 | 5.0 | 7,156 | 5.0 | 7,156 | 5.0 |
| **37** | 7,156 | 5.0 | 7,156 | 5.0 | 7,156 | 5.0 |
| **38** | 7,156 | 5.0 | 7,156 | 5.0 | 7,156 | 5.0 |
| **39** | 7,156 | 5.0 | 7,156 | 5.0 | 7,156 | 5.0 |
| **40** | 21,592 | 6.9 | 21,634 | 7.0 | 21,623 | 7.0 |
| **41** | 14,056 | 4.7 | 14,056 | 4.7 | 14,056 | 4.7 |
| **42** | 672 | 3.9 | 672 | 3.9 | 672 | 3.9 |
| **43** | 672 | 3.9 | 672 | 3.9 | 672 | 3.9 |
| **44** | 672 | 3.9 | 672 | 3.9 | 672 | 3.9 |

| Road Link | 2014 | | 2016 (Without Scheme) | | 2016 (With Scheme) | |
|---|---|---|---|---|---|---|
| | AADT | %HDV | AADT | %HDV | AADT | %HDV |
| **45** | 287 | 0.8 | 287 | 0.8 | 287 | 0.8 |
| **46** | 21,592 | 6.9 | 21,634 | 7.0 | 21,623 | 7.0 |
| **47** | 21,592 | 6.9 | 21,634 | 7.0 | 21,623 | 7.0 |
| **48** | 21,592 | 6.9 | 21,634 | 7.0 | 21,623 | 7.0 |
| **49** | 17,772 | 7.8 | 17,814 | 8.0 | 17,803 | 7.9 |
| **50** | 18,088 | 7.6 | 18,129 | 7.9 | 18,118 | 7.8 |

A5.14 Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by DfT (DfT, 2011).

A5.15 Figure A5.2 shows the road network included within the model.

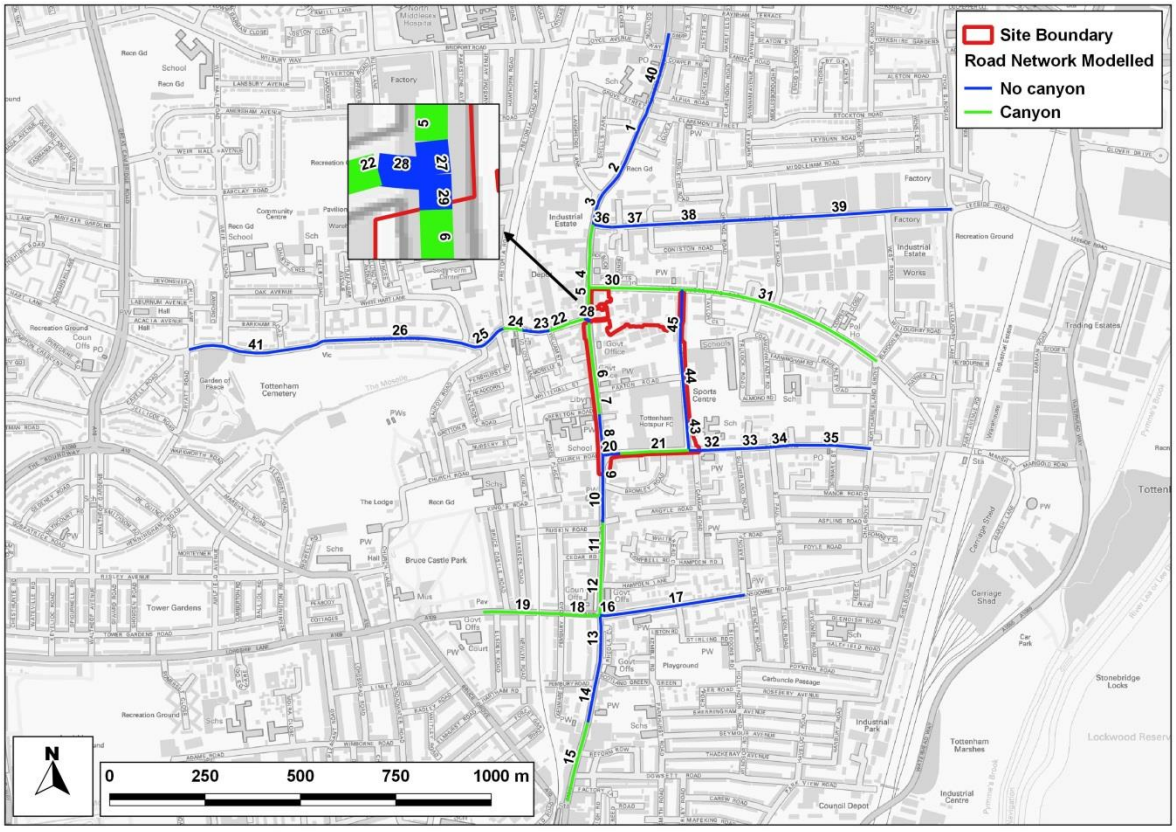


**Figure A5.2: Modelled Road Network**

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## Model Verification

A5.16 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements.

### *Background Concentrations*

A5.17 The background concentration of nitrogen dioxide for the verification site has been taken from the national maps of background concentrations available from the Defra LAQM Support website (Defra, 2015b). The background concentrations for the verification sites are presented in Table A5.2.

**Table A5.2: Background Concentrations used in the Verification for 2014**

| Monitor | $NO_2$ | $PM_{2.5}$ |
|---|---|---|
| **HGY1** | 29.0 | 15.0 |

### *Nitrogen Dioxide*

A5.18 Most nitrogen dioxide ($NO_2$) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + $NO_2$). The model has been run to predict the annual mean NOx concentrations during 2014 at the HGY1 automatic monitoring site. Concentrations have been modelled at 3.0 m, the height of the monitor inlet.

A5.19 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NOx concentration and the predicted background NOx concentration.

A5.20 An adjustment factor has been determined as the ratio of the 'measured' road contribution and the model derived road contribution. This factor has then been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations. The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NOx concentrations with the predicted background $NO_2$ concentration within the NOx to $NO_2$ calculator (Defra, 2015b).

A5.21 The data used to calculate the adjustment factor are provided below:

- Measured $NO_2$ : 43.82 µg/m$^3$
- 'Measured' road-$NO_x$ (total – background): 33.99 µg/m$^3$
- Modelled road-$NO_x$ = 17.94 µg/m$^3$

- Primary Road-$NO_x$ adjustment factor: = **1.89**[9]
- Final Modelled Total $NO_2$ (using Defra $NO_x$:$NO_2$ calculator) = 44.5 µg/$m^3$

A5.22 The factor implies that the unadjusted model is under-predicting the road-NOx contribution. This is a common experience with this and most other models.

### *$PM_{10}$ and $PM_{2.5}$*

A6.6.1 The model has been run to predict annual mean road-$PM_{2.5}$ concentrations during 2014. A similar process to calculate the road-$NO_x$ adjustment factor has been followed.

A6.6.2 The measured road-$PM_{2.5}$ and modelled road-$PM_{2.5}$ concentrations are compared to provide the factor for $PM_{2.5}$. The data used to calculate the adjustment factor are provided below:

- Measured $PM_{2.5}$: 16.40 µg/$m^3$
- 'Measured' road-$PM_{2.5}$ (measured – background at monitor): 16.40 – 14.99 = 1.41 µg/$m^3$
- Modelled road-$PM_{2.5}$ = 0.61 µg/$m^3$
- Road-$PM_{2.5}$ adjustment factor: 1.41/0.61 = **2.31**

## Model Post-processing

### *Road Traffic*

#### Nitrogen oxides and nitrogen dioxide

A5.23 The model predicts road-NOx concentrations at each receptor location. These concentrations have then been adjusted using the primary adjustment factor, which, along with the background $NO_2$, has been processed through the NOx to $NO_2$ calculator available on the Defra LAQM Support website (Defra, 2015b). The traffic mix within the calculator has been set to "All London traffic", which is considered suitable for the study area. The calculator predicts the component of $NO_2$ based on the adjusted road-NOx and the background $NO_2$. This has then been adjusted by the secondary adjustment factor to provide the final predicted concentrations.

[9] Based on un-rounded values

# A6 Adjustment of Short-Term Data to Annual Mean

A6.1 The Haringey Town Hall automatic monitor had large gaps in its data collection during 2014. No nitrogen dioxide data were collected between 27th May and 1st October, resulting in an annual data capture rate of 65.3%. $PM_{10}$ data capture was very low, at just 25.7% for the year. $PM_{2.5}$ data had gaps between 17th February and 7th March and between 10th August and 27th September, resulting in a total annual data capture rate of 82.2%.

A6.2 In accordance with the guidance set out in Box 3.2 of LAQM.TG(09), the nitrogen dioxide and $PM_{2.5}$ data have been adjusted to an annual mean, based on the ratio of concentrations during the short-term monitoring periods to those over the 2014 calendar year at nearby background automatic monitoring sites. $PM_{10}$ data capture was so low that it would not be appropriate to annualise.

A6.3 The annual mean nitrogen dioxide concentrations and the period means for each of the three monitoring sites from which adjustment factors have been calculated for nitrogen dioxide are presented in Table A6.1, along with the Overall Factor. The "short-term monitoring period" referred to covers the periods 1st January to 27th May and 1st October to 31st December.

**Table A6.1: Data used to Adjust Short-term Nitrogen Dioxide Monitoring Data at Haringey Town Hall to Annual Mean**

| Period Mean Concentration ($\mu g/m^3$) | Camden Bloomsbury | Harrow Stanmore | Kensington & Chelsea North Kensington | Overall Factor |
|---|---|---|---|---|
| **2014 Calendar Year** | 51.2 | 24.6 | 34.4 | - |
| **Short-Term Monitoring Period** | 54.0 | 28.3 | 37.3 | - |
| **Adjustment Factor** | **0.949** | **0.869** | **0.921** | **0.913** |

A6.4 The annual mean $PM_{2.5}$ concentrations and the period means for each of the two monitoring sites from which adjustment factors have been calculated for $PM_{2.5}$ are presented in Table A6.2, along with the Overall Factor. The "short-term monitoring period" referred to covers the periods 1st January to 17th February, 7th March to 10th August and 27th September to 31st December.

**Table A6.2: Data used to Adjust Short-term $PM_{2.5}$ Monitoring Data at Haringey Town Hall to Annual Mean**

| Period Mean Concentration ($\mu g/m^3$) | Camden Bloomsbury | Hillingdon Harlington | Overall Factor |
|---|---|---|---|
| **2014 Calendar Year** | 14.6 | 14.0 | - |
| **Short-Term Monitoring Period** | 14.3 | 13.6 | - |
| **Adjustment Factor** | **1.028** | **1.026** | **1.027** |